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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Basic Facts for Industrial Expansion

THE Committee upon Industry and Trade, which was appointed by the last Government and continued with the approval of the present administration to inquire into the conditions and prospects of British business, has just issued a survey of its activities. Such problems as the relation of present trade volumes to pre-war totals, the movements of British exports as between overseas markets, and the possibilities of better business both in old and new areas, are being dealt with upon a scale never hitherto attempted. As stated by the Chairman, Sir Arthur Balfour, K.B.E., of Sheffield, the inquiry marks the commencement of an era of scientific investigation on behalf of British trade. A mass of documentary evidence relating to the development and present condition of exporting trades is being assembled, and it is hoped to show how the interests of these may be furthered by technical education and research.

In the first instance, the main attention of the Committee has been devoted to the larger producing industries such as chemicals, textiles and iron and steel. Statistics and views are being taken from associations of merchants, manufacturers and workpeople representing all the sections involved. It may be doubted whether any committee has ever had wider terms of reference or has been entrusted with an investigation of greater moment. Consideration will be necessary of the absorption capacity and trading conditions of almost every part of the world. By this means a true stocktaking of immediate and future potentialities for British trade, transport, finance and labour will be made available, in order that the business community may readily understand the commercial situation as it really is. Since so many of the subjects are interconnected, it will not be possible to issue interim reports, as a conclusion upon any one matter would be immature before the final sitting. There will, however, be a departure from precedent in the issue from time to time of books, containing collected information of a definitely educational character, adequately prepared to give practical assistance to our commerce. These publications, together with the final report, should result in a solid contribution to our world trade and will indicate concisely the manner and means of obtaining a fuller measure of trade and employment for this country.

America and Tetra-Ethyl Lead

THE general consternation which was caused in America by the use of tetra-ethyl lead in "anti-knock" motor spirits would seem to be dying a natural death. Suspicion appears to have been fastened on these mixtures after a mishap which occurred at the works of a prominent oil undertaking in New Jersey, where five men lost their lives as a result, it was suggested, of tetra-ethyl lead poisoning. The occurrence led to the prohibition in some districts of the sale of lead-treated petrol; but all along a good deal of doubt was expressed as to the likelihood of "anti-knock" mixtures of the kind being any more harmful than an untreated spirit. In this country the report of the Empire Motor Fuels Committee stated that interesting results had been obtained in the prevention of "knocking" by adding very small quantities of pyridene, di-ethyl, or tetra-ethyl compounds to a liquid fuel, but as yet there seems to be no precise explanation of the exact function of the ingredient. In America a petrol containing tetra-ethyl lead and a small amount of carbon tetra-chloride (which is added to remove the lead in the form of lead chloride, and to prevent the corrosion of sparking plugs) has been marketed on a fairly large scale under the name of "ethyl gas." In another prescription the mixture is prepared by adding to petrol 0·06 per cent. of tetra-ethyl lead and 0·04 per cent. of a halogen carrier such as ethylene dibromide or trichlorethylene.

Owing to the considerable importance of the matter from the point of view of public health the U.S. Bureau of Mines undertook a protracted series of experiments by submitting various small animals to the products of combustion of ethyl-treated mixtures. The results of the experiments are now made known, and they should serve to allay any public misapprehension which exists in America, while they should render the way clear for the introduction of the treated fuel over

here. The animals used in the experiments were exposed for about six months to unusual concentrations of exhaust gases from ethyl petrol, and at the end of this period they showed no symptoms whatever of lead poisoning. This would seem to offer fairly conclusive proof that there is but the remotest danger of sufficient accumulation of lead products in the streets of a town, through the discharge of scale from motor engines, to cause lead poisoning. The balance of opinion in America seems now, in fact, definitely to lean towards the view that once the tetra-ethyl lead is intermixed with the petrol there is little possibility of its being harmful. The scare, which the American daily papers have not hesitated to make the most of, probably arose through confusion of the treated fuel with "ethyl fluid," which is a mixture of concentrated tetra-ethyl lead and ethylene dibromide ready for admixture with petrol. This, of course, is not a motor fuel and would certainly not be sold to the public.

The Efficacy of Insulating Materials

WHEN the Food Investigation Board published their report for the year 1922 they included a description of tests which had been conducted by the Engineering Committee in connection with the diffusion of gases through porous materials. The subject of diffusion is one which is of considerable importance in many branches of chemical engineering, but it is of special importance in connection with food-storage problems for the reason that for certain articles of food (fruit and vegetables in particular) systems of gas storage are employed, and a problem which has to be faced is the moderately high rate of leakage of carbon dioxide through the walls of the chamber. In the 1922 report a number of coating materials were experimented with, and the instructive conclusion was arrived at that a gas such as carbon dioxide can escape through a porous slab in more than one way. It may move as in pure diffusion, where the rate of flow is proportional to the pressure excess; but in plaster and similar materials there are various microscopical holes and channels in which the gas may flow as a stream does through pipes. The Committee pointed out at that time that certain varieties of paint coverings had been found of considerable assistance in checking leakage, and in their 1923 report which has recently come to hand they return to the subject. The later experiments were modified to the extent that no pressure was applied on the side on which carbon dioxide was introduced, the sole driving force of the gas merely being due to its greater concentration on one side of the wall than on the other. The main point which emerges from the test is that the leak outwards appears to be accurately proportioned to the concentration difference subsisting at the time.

Among other interesting experiments which were conducted by the Board are those relating to the thermal conductivity of various insulating materials, and also the moisture content of the same substances. One particular insulating material is certainly worthy of mention, for its efficiency in some instances was found to be remarkably high. This consists of a hard form of expanded rubber the surface of which resembles ebonite but the interior of which is cellular. In the moisture tests, again, a somewhat surprising feature is exhibited by slag wool, which showed a remarkably slight capacity for absorbing water vapour when placed in an atmosphere of comparatively high saturation. With air at a maximum of saturation, for instance, the moisture content of cork was found to be 20 per cent., of charcoal 9·6 per cent., and of expanded rubber 5·6 per cent., whereas in the slag wool there was no measurable quantity. The report as a whole makes interesting, if rather specialised, reading; and for those who are anxious to follow out the experiments mentioned above in detail it may be mentioned that copies may be obtained from H.M. Stationery Office, Adastral House, Kingsway, price 3s.

The Newer Ammonium Compounds

AN interesting contribution to the views which have been expressed in connection with the efficacy of some of the newer forms of ammonium compounds when used as fertilisers was made recently by Mr. J. M. Braham in a paper which he presented before the Division of Fertiliser Chemistry of the American Chemical Society. In speaking of ammonium nitrate, Mr. Braham said that the demand for enormous quantities of this material during the war for use as a high explosive ingredient resulted in the development of processes by which it can be produced from the atmosphere at a cost per unit of nitrogen comparable with that of Chilean nitrate and by-product ammonium sulphate. Ammonium nitrate has been shown to be an excellent fertiliser material, but, unfortunately, it absorbs moisture from the atmosphere so readily that it is difficult to handle or use, particularly in mixed fertilisers. Various methods have been devised to overcome this difficulty. In Germany a double salt consisting of nearly equal parts by weight of ammonium nitrate and ammonium sulphate is now being extensively used. This material is commonly referred to as ammonium sulphate nitrate. Ammonium nitrate is also mixed with potash salts, particularly the comparatively high-grade potassium chloride, yielding a mixture of ammonium chloride and potassium nitrate through double decomposition. While both the double and mixed salts of ammonium nitrate thus obtained are somewhat hygroscopic, they are being successfully used in Germany; in fact, the main source of nitrate nitrogen in German agriculture is now ammonium nitrate applied chiefly in the mixtures mentioned. The hygroscopicity of ammonium nitrate can be reduced by producing the material in the forms of grains and oil-coating them. The cost of this treatment is by no means prohibitive, and a product which is very much less hygroscopic than calcium nitrate or Norwegian saltpetre can be produced.

The development of the synthetic ammonia process, particularly for operation in conjunction with the Solvay soda process, is, of course, opening up new possibilities for the cheap production of ammonium chloride, and developments along this line are now under way in several countries. The fertiliser value of this material is being investigated at numerous experimental stations in this country and abroad. If it can be demonstrated that ammonium chloride is a satisfactory fertiliser, it will undoubtedly become one of the important nitrogen materials. It is interesting

to put on record these views from America, particularly as they seem to correspond very closely with the opinions which have been expressed by leading agricultural chemists over here. It seems, moreover, to be generally agreed in America that the products of atmospheric nitrogen fixation will have to be largely relied upon to meet the constantly growing demands, and while this means of supplying fixed nitrogen may not be the ultimate solution of the nitrogen problem, it will in all probability be the main contributor of fixed nitrogen for several decades to come.

Payment of Income Tax

Now that income tax demands for the first instalment of 1924/5 assessments are being sent out by the collectors, widespread attention has been drawn to the extended power of recovery given to the Inland Revenue authorities by section 30 of the Finance Act, 1924. There has been a disposition in some quarters to regard the enactment as the prelude to a considerable number of persons being sent to prison for non-payment of income tax, but we look upon this as too pessimistic a view. Most individuals feel a repugnance to drawing a cheque for their income tax, but sooner or later in the majority of cases it is overcome by the insistence of the tax-collector. In some instances, however, those who can afford to pay persistently neglect or refuse to do so, and hitherto in such cases (other than those of small-wage earners assessed quarterly), where the taxpayer has had no goods upon which distress could be levied, the only means of recovery available has been the cumbersome and costly method of suing in the High Court.

In future in all cases where the amount of income tax due under any assessment is under £50 it may be recovered summarily as a civil debt, i.e., by proceedings before the local magistrates. Since 1918 this procedure has been available in the case of small-wage earners who are assessed quarterly, and section 30 of last year's Finance Act is an extension rather than an innovation. Proceedings before the local Bench will be taken by the collector, but only after the necessary authority has been given to him by the Commissioners. Before a defaulting taxpayer can be committed to prison a judgment summons must be taken out. This has to be served personally on the judgment debtor whenever practicable, and if not served personally then an order has to be obtained for substituted service in such a way that it shall come to his notice. Before the Court makes a committal order it must be satisfied that the debtor has had the means to pay and that non-payment is due to his refusal or neglect.

It will be seen from this that the average individual need not go in fear of a stay in prison while his income tax remains unpaid, the object of the section under review being not to impose a heavier burden upon the taxpaying public as a whole, but rather to strengthen the hands of the Inland Revenue against those members of it who seek to escape their share of the common lot. In cases where proceedings are taken against a person assessed under Schedule E for salary, etc., a written statement as to the salary paid signed by the employer or some responsible person in his employ will be *prima facie* evidence of payment, a special clause to this effect having been inserted in the Act.

Points from Our News Pages

An interesting history of the "Hardinge" Mill, including comparative statistics, is given by Mr. J. C. Farrant, M.A.I.M.E. (p. 98).

Details of the industrial manufacture of insulin are described and illustrated in an article by Mr. A. S. Wilson-Jones, B.A. (p. 102).

In an article on "The Chemical Engineer of To-day," Mr. W. H. Coleman, F.I.C., gives instructive particulars of the work of the Institute of Chemical Engineers, and suggests a definition of "chemical engineer" (p. 104).

"Studies in Filtration" is the subject of a paper read before the Institution of Chemical Engineers on Wednesday (p. 106).

An invention of considerable commercial importance in the form of a substance capable of rendering fabrics proof against moths is further described and a lecture on the subject reported (p. 108).

An impromptu incident in the West African tour of Lord Leverhulme is illustrated (p. 110).

The death is recorded of Mr. Samuel Thornley (p. 112); Mr. H. Nickols (p. 112).

Our London chemical market report shows a decided improvement and a steady expansion in consumptive demand (p.115).

Our Scottish market report reveals a level state, and business in the heavy chemical market is fairly satisfactory (p. 121).

The Calendar

Feb.		
2	Royal Society of Arts: Cantor Lecture (III): "Radiological Research—A History." V. E. Pullin. 8 p.m.	John Street, Adelphi, London.
2	Society of Chemical Industry (London Section): "The Constitution of Coal." Professor W. A. Bone. "Kinetics of Hydrogenation," E. J. Lush. "Tar Distillation by Means of the T.I.C. (Lead Bath) Process." C. O. Condrup and E. W. Smith. 8 p.m.	Burlington House, Piccadilly, London.
2	University of Birmingham Chemical Society: "The Genesis of Petroleum." S. W. Needham. 5.30 p.m.	Chemical Lecture Theatre, Edgbaston.
3	Institute of Metals (Birmingham Section): Discussion on "Metal Melting."	Chamber of Commerce, New Street, Birmingham.
3	Society of Chemical Industry (Birmingham Section): "The Action of Light on the Photographic Plate." T. Slater Price. "The Use of Iodine Pentoxide in the Estimation of Carbon Monoxide." J. Ivon Graham and F. Lawrence. 7.15 p.m.	University Buildings, Edmund Street, Birmingham.
3	Institution of Petroleum Technologists: "Decomposition of Paraffin Wax at 450° C. in Presence and in Absence of Hydrogen under High Pressure." H. Waterman and J. N. J. Perquin	Royal Society of Arts, John Street, Adelphi, London.
4	Royal Society of Arts: Trueman Wood Lecture: "The Stability of Atoms." Sir Ernest Rutherford. 8 p.m.	John Street, Adelphi, London.
4	Society of Public Analysts Annual Meeting. 8 p.m.	Burlington House, Piccadilly, London.
5	Chemical Society	Burlington House, Piccadilly, London.
5	Society of Dyers and Colourists (West Riding Section): "Colour Problems." Dr. H. E. Armstrong.	
6	Society of Chemical Industry (Manchester Section): "The Detection and Determination of Alpha Naphthol in Beta Naphthol." Dr. Thomas Callan. "Some Organic Rubber Vulcanising Accelerators." W. J. S. Naunton. 7 p.m.	Textile Institute, 16, St. Mary's Parsonage, Manchester.
6	University of Manchester: "The Romance of Metallurgy"—Lecture II. "Metals as Crystals." Professor F. C. Thompson.p.m.	Lecture Room, Chemistry Dept.

The Origin of the Hardinge Mill

By J. C. Farrant, M.A.I.M.E.

In the following article a brief account is given of the earliest stages of the well-known Hardinge Mill, with photographs and operating data. We hope, as space and opportunity permit, to publish further notes on later developments.

In 1906 the writer was employed upon the construction of a small concentrating mill in Colorado. The work of construction was completed by the end of the summer and milling started in the autumn of 1906. Mr. H. W. Hardinge was consulting engineer and Mr. E. V. Neelands was in charge of operations.

The plant was designed to treat a silver ore, and consisted of the following equipment: Jaw breaker, set to give a product of 2 in., Dodge crusher to $\frac{1}{2}$ in. product, 30 in. diam. rolls to deliver minus $\frac{3}{16}$ in. The product from the rolls passed over a callow screen of 20 mesh. This was afterwards replaced by a home-made shaking screen, the screen receiving its motion by securing one end to the back of a Wilfley table.

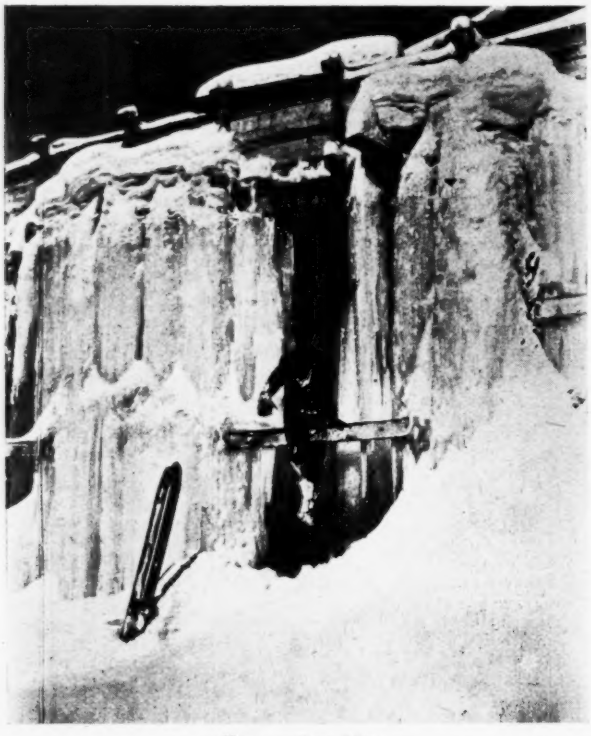


Fig. 1—The Mill.

The oversize from this screen was fed to a 6 ft. by 6 ft. tube mill and ground to 20 mesh. The undersize of screen was tabled, and middlings and tails rejoined the oversize of screen as fed to the tube mill. The tube mill product was laundered to a series of callow tanks, and thence on to Wilfley tables, where a concentrate and tailing was made, tailings going to waste.

The values were generally associated with "grey copper," which tended to slime badly, thus affecting the recovery of values. It was noticed on more than one occasion that dark patches of floating substance would pass off with the tailings at the head of the Wilfley tables. Upon analysis it was found that these patches were composed of grease and oil and ran fairly high in values. Instructions were given to prevent grease from getting into the pulp—a golden opportunity lost—for this was the basis of one of the greatest metallurgical advances ever made, namely, the recovery of values by oil flotation.

Our object was to obtain an evenly ground feed for final tabling. By decreasing the feed to the tube mill and incidentally lowering mill output, the values slimed too much and floated over with tailings. On the other hand, any

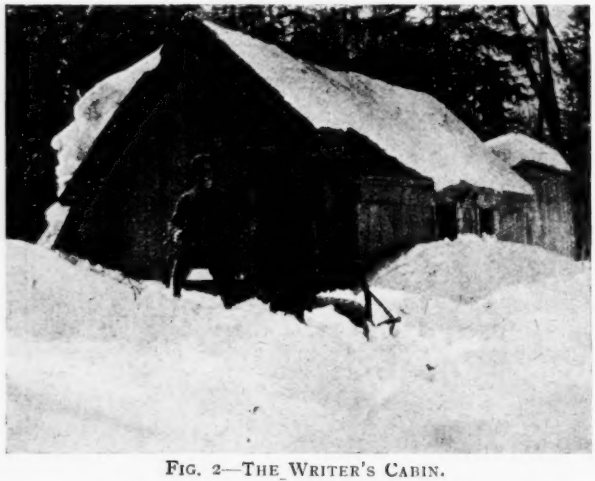


Fig. 2—The Writer's Cabin.

appreciable increase in the feed to the tube mill produced too much oversize, which, on being returned to the mill, frequently choked it.

This choking, unless noticed at once, caused considerable delay, as it sometimes required hours for the mill to "muck out." Thus it will be seen that the feed to the tube mill had to be controlled between narrow limits.

Local stream pebbles were used as grinding media, as the cost of importing pebbles was prohibitive. The mill was situated at an elevation of 9,000 feet and in a district where the ground was snow-covered for seven or eight months out of the twelve, and during a part of the winter we were virtually cut off from outside sources of supply. Hence we were thrown very much on our own resources for repairs or renewals (in fact, it was a country where gunney sacks and baling wire were spoken of as legal tender). It was amongst these surroundings that the Hardinge Conical Mill principle was first put into practice in 1907 (Figs. 1 and 2).

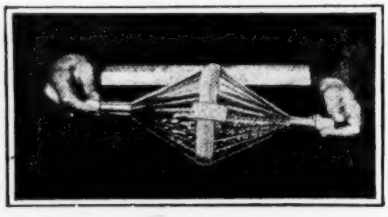


Fig. 3.

Mr. Hardinge, the inventor, was acting as consulting engineer to another group which operated a small mill in Canada, and they had very much the same grinding problem, namely, to obtain a comparatively uniform product without sliming on the one hand or too much oversize on the other. It was while Mr. Hardinge was standing near the mine dump watching the waste rolling down the incline that the idea of the conical mill was born—i.e., the natural segregation of coarse rock from fine produced on a cone. Reversing this, was it not possible that a cone, instead of a cylinder, would produce a segregation of different sized particles within the cone?

A trial was promptly made in the office by joining two laboratory funnels together with adhesive tape. This was partially filled with sand of different sizes, and by rotating this "model" it was found that an automatic segregation took place (Fig. 3).

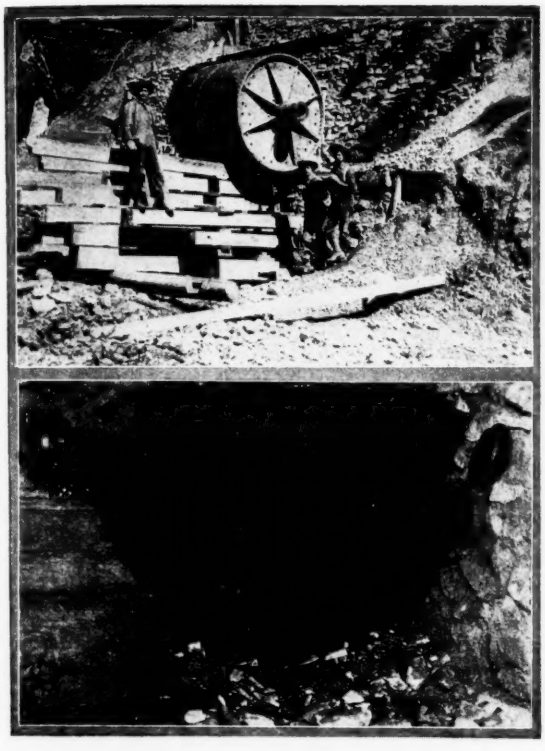


FIG. 4

At this time I knew nothing of these experiments until Mr. Neelands came in one afternoon and told me that the "old man" had sent some castings up from Denver which we were to fix into our tube mill. I remember remarking: "Why, I've just spent two hours cleaning up the tube mill floor," little realising the great effect the placing of these castings in the mill was to produce in mining and industrial circles. These castings were merely plates for forming a conical mill within a cylindrical mill by blocking off the corners. After these castings were in position a load of pebbles was thrown in and the mill was started up again after a few days' shutdown (Fig. 4).

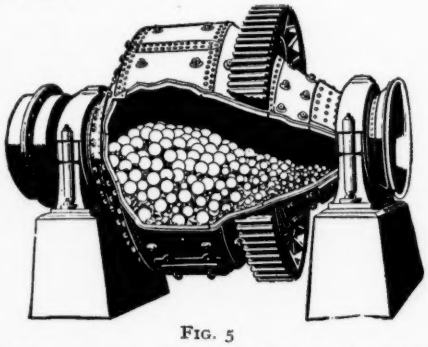


FIG. 5

I should here mention that under the ore bin receiving the product from the jaw crusher was a plunger feeder operated by a belt drive and adjusted by a slot and stud arrangement on an eccentric. This feeder had been set to deliver a rate of feed which the tube would handle, and the feed was turned into the "cone mill" at the same rate. The result was remarkable. During several days' continuous running no oversize on the trommel attached to the mill was observed, although there were considerably fewer pebbles in the cone mill than in the tube mill; consequently the horse-power was less. This fact indicated at once that a greater output could be obtained from a cone mill than from a tube mill, where the power absorbed by the two was the same and other conditions were equal.

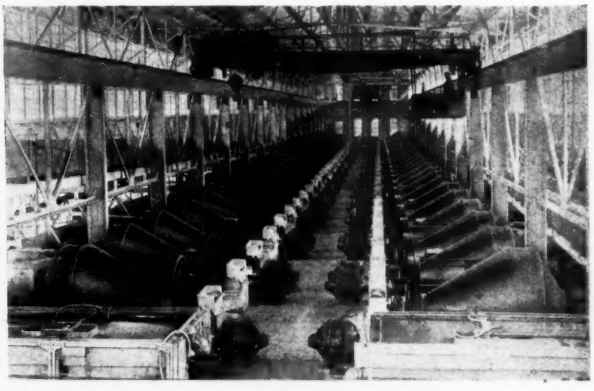


FIG. 6

Screen analysis of the discharge and a report was sent to Mr. Hardinge, and on that report he built the first 6 ft. dia. by 22" cyl. Hardinge Mill, which was installed at the Cobalt Central Mines in 1908. A report of the performance of this first mill is given with operating data, the gangue treated being diabase:—

Mesh.	Feed. Per cent.	Product. Per cent.
4	—	—
8	7·5	—
14	52·5	—
20	10	4
40	12·5	9
60	8	24
80	4	12·2
100	·2	11·8
100	5·3	39
Capacity	96 tons per 24 hours.	
Charge	2,500 lb. pebbles.	
R.P.M.	29	
H.P.	12·3	
Water	30 gallons per minute.	

This report attracted considerable attention, and inquiries became numerous. A number of installations were made of these 6 ft. dia. by 22 in. cyl. Hardinge Mills. They were all used on the same class of work, taking a feed of about 8 mesh and grinding to 20, 40 or 60 mesh as subsequent treatment warranted. The technical press were not slow to bring this new mill to the attention of their readers, and the larger companies became interested (Fig. 5).

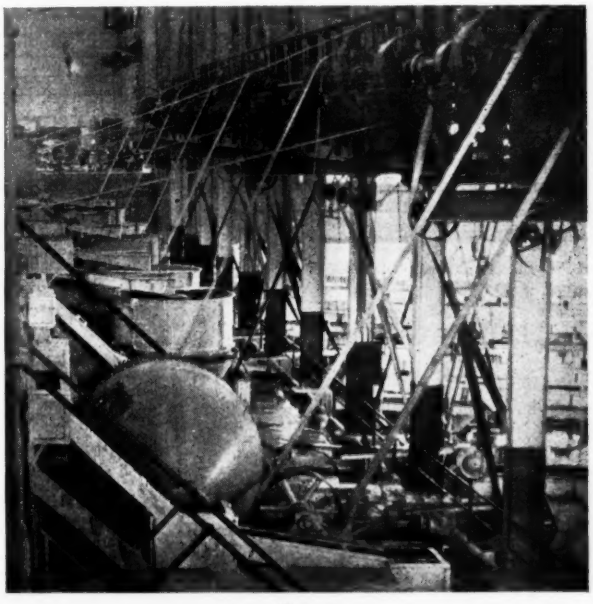


FIG. 7

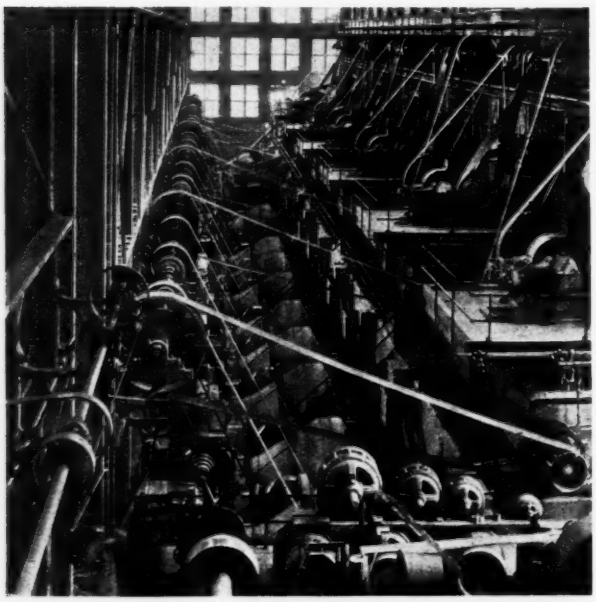


FIG. 8

In 1909 the Calumet and Hecla Copper Co. purchased and installed one of these mills in a plant together with two mills of the Chili type, and ran all three under identically the same conditions for several months to ascertain which would give them the best results.

The gangue treated was Lake Conglomerate, and the results in the case of the Hardinge Mill are shown below :—

Mesh.	Feed. Per cent.	Product. Per cent.
6	0·25	—
8	2·70	—
10	5·10	—
20	25·70	0·02
40	36·40	0·15
60	19·35	2·10
80	7·00	6·55
100	1·40	6·00
150	1·25	16·90
200	0·70	26·70
−200	0·20	41·58

Capacity	40–45 tons per 24 hours.
Charge	3 tons pebbles.
R.P.M.	27
H.P.	34–37.
Water	40 per cent.

The same company are now operating approximately 200 8 ft. diameter Hardinge Mills (Fig. 6).

The Miami Copper Co. was at this time running a battery of mills in their grinding section, and as a result of the Calumet and Hecla test Miami installed an 8 ft. diameter Hardinge Mill in 1911. The capacity of plant at this time was approximately 2,000 tons per day. Comparative results between the Chili type of mill and the Hardinge mill are shown below (Fig. 7) :—

Mesh.	Chili Type of Mill. Feed.	Chili Type of Mill. Product.	Hardinge Mill. Feed.	Hardinge Mill. Product.
Plus 4	13·9	0	12·9	0
,, 10	47·5	0	47·3	0
,, 20	22·9	2·3	26·8	0·2
,, 30	5·2	11·8	5·0	3·2
,, 40	0·9	6·7	0·8	4·9
,, 60	1·0	5·4	0·8	13·8
,, 80	0·5	6·3	0·4	10·4
,, 100	0·4	7·2	0·3	8·6
,, 150	0·5	10·6	0·3	8·0
,, 200	0·7	7·5	0·5	10·0
Minus 200 sand	1·2	10·6	0·8	10·0
,, 200 slime	5·3	31·6	4·1	30·9

	Crude-Ore Tonnage. H.p. Hr. per Ton.	Actual Feed Tonnage. H.p. Hr. per Ton.
Chili Type of Mill	7·5	10·7
Hardinge mill	6·7	9·6

Summarising the comparative operating costs, the net saving in cost by operating with the Hardinge mill was as follows :—

	Pence per Ton.
Labour	0·26
Power	0·38
Maintenance	0·278
Depreciation	1·25
	2·168d.

In 1912 sixteen Hardinge pebble mills were installed and the other mills removed. The approximate capacity of plant after effecting this change was 3,000 tons per day (Fig. 8).

The Hardinge pebble mills have now been replaced by Hardinge ball mills, and the fine rolls on second bench have also been replaced by Hardinge primary ball mills. The capacity is 7,500 tons per day. This remarkable evolution had taken place under the same roof. The tonnage increased from 2,000 tons per day to 7,500 tons per day, each stage being accomplished by a reduction in working costs (Fig. 10).

Before passing on to the effect ball-milling has had on ore reduction generally during the past ten or twelve years, it may be mentioned that the Hardinge pebble mill has largely superseded other types for regrinding. Following the introduction of the Hardinge mill, short tube mills of various makes were placed on the market, but in more than one case these were converted by arrangement with Mr. Hardinge into conical mills. The dotted line in the photograph shows where the corners were blocked off. This resulted in a saving of power without loss of capacity for the grinding required. In the figures given below there is shown a saving of 14 per cent. in power and a fall of 10 per cent. in capacity, but after the change to a cone mill a coarser feed was milled to a fine granular product (Fig. 9).

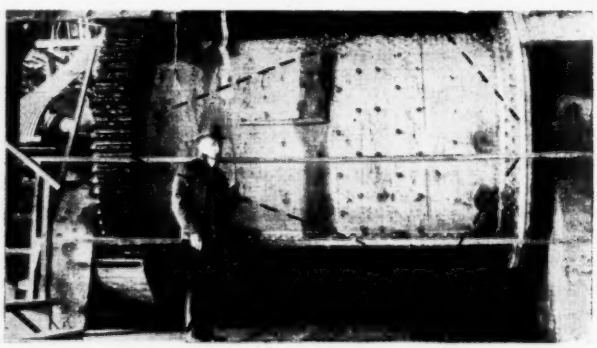


FIG. 9

Classification of Work of Tube and Cone Mills.

Screen.	Before Change. Feed. Per cent.	Before Change. Product. Per cent.	After Change. Feed. Per cent.	After Change. Product. Per cent.
Plus 10	29·5	—	41·15	—
,, 20	45·5	—	31·55	—
,, 30	16·0	0·5	13·80	0·55
,, 40	6·0	0·5	9·05	2·5
,, 60	4·0	2·5	4·10	2·25
,, 80	1·5	5·0	0·55	4·80
,, 100	1·5	8·0	0·50	10·50
,, 150	0·5	5·5	0·5	17·20
,, 200	0·5	20·5	0·3	16·00
Minus 200	1·0	57·5	0·5	41·20

The capacity of the mill before the change was 98·64 tons per day, while afterward it was 88·2 tons, a reduction of about 10·5 per cent. The horse-power required before the change was 75·6, and afterward 65, a saving of about 14 per cent.

At the Arizona plant, a standard Hardinge mill, 8 ft. by 36 in., was run under the same conditions as a 6 ft. by 9 ft. cylindrical tube mill, where the feed to the mills and the product were practically identical. It will be seen that there

was a gain in tonnage ground per horse-power unit in favour of the Hardinge mill :—

	Hardinge Mill.	Tube Mill.
Per cent. solids	44·4%	44·1%
Tons per 24 hours	217·1	145·0
Horse-power	59·41	50·0
,, per ton	6·947	8·299
Tons per horse-power	3·66	2·9
Relative efficiency	100%.	79·3%
Pounds pebbles per ton	1·151	0·862
Cost of pebbles ,, at 1·349c. per lb.	1·55c.	1·16c.
,, lining ,,	0·62c.	1·05c.
,, power ,, at 1·106c. per k.w.h.	5·73c.	6·85c.
,, per ton for power, pebbles and lining ..	7·90c.	9·06c.

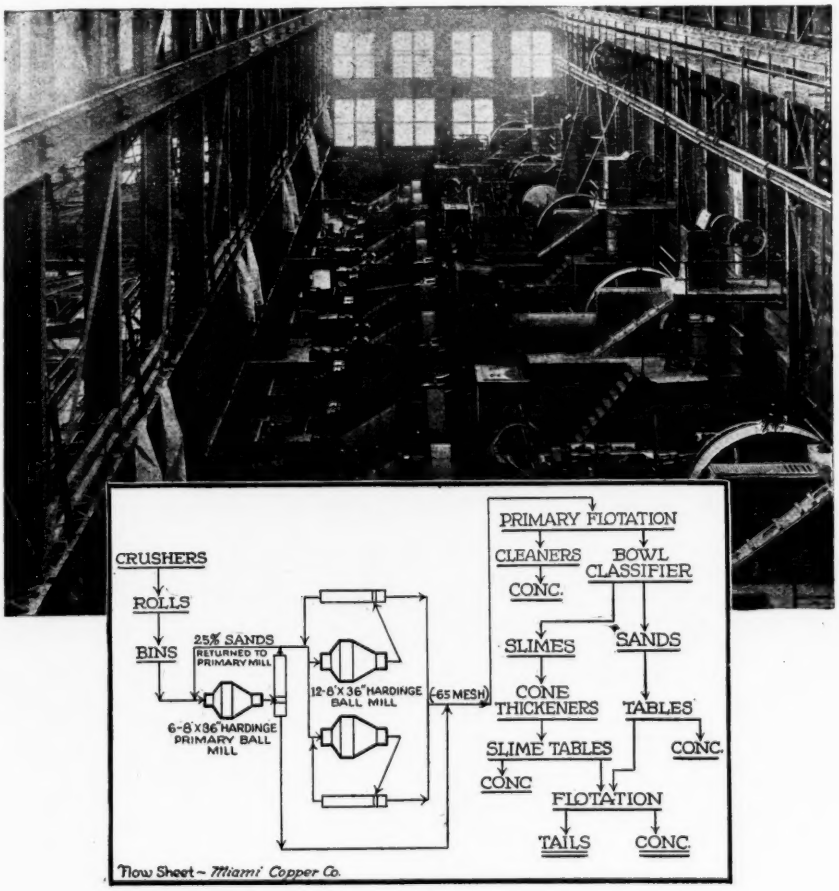


FIG. 10

Screen Analyses.

	Hardinge Mill. Feed.	Hardinge Mill. Product.	Tube Mill. Feed.	Tube Mill. Product.
On ½ in. mesh	0·5	0·0	0·9	0·0
,, 10 ,,	26·0	0·1	26·0	0·1
,, 14 ,,	17·8	0·6	17·7	0·5
,, 20 ,,	14·5	2·1	13·9	1·5
,, 28 ,,	13·2	8·3	13·1	6·6
,, 35 ,,	8·0	10·9	8·9	10·0
,, 48 ,,	6·9	14·5	8·0	16·1
,, 65 ,,	3·7	10·7	4·5	11·9
,, 100 ,,	2·7	9·9	2·9	10·9
,, 150 ,,	1·9	7·9	1·5	8·5
,, 200 ,,	0·8	4·2	0·6	4·5
Thru 200 ,,	4·0	30·8	2·0	29·4

Control in Steam Production

(FROM A CORRESPONDENT.)

IN works where scientific control of processes is in operation it is simply a matter of logic to treat the production of the steam used for power purposes as one of the essential processes, and control it in the same way. There is always, of course, some kind of check on the materials used and on the quality of the product, but by such crude methods as would not be tolerated in a chemical process. It is a well established fact in chemical practice that proper control frequently makes all the difference between commercial success and failure. Yet steam raising is just as susceptible to improvement by scientific methods, but it is commonly left to take care of itself, and no one troubles about it so long as there is plenty of steam and general working expenses are not excessive. There are, of course, exceptions where the value of control of the power plant has been fully appreciated, but there are still very many works where hit-or-miss methods are in use. Steam raising as a process is not of the simplest, and to control it measurements are required of so many factors—fuel, water, temperature, pressure, draught, composition of flue gases and so on—that this may at times prevent its adoption. There are so many types of instrument available, however, that a study of makers' catalogues should indicate to the plant engineer a form which could be most readily fitted to his particular plant, giving the increased economies in working at which such systems aim.

Broadly speaking, there are two alternative ways of controlling steam raising, which may be named semi-automatic and automatic. By semi-automatic control it is meant that all recording is done automatically on charts but that adjustments of conditions are carried out at the discretion of the responsible engineer. Automatic control implies that the recording instruments embody apparatus for altering conditions without human interference. Each variable should be considered separately and controlled by whichever method seems likely to give the best results and the least trouble.

Although there are so many variable factors in steam raising, it is possible sometimes to reduce the number of recording or controlling instruments without impairing efficiency. For example, it is possible sometimes to obtain data of the flue gas conditions by measuring the air-flow to the furnace instead of determining the composition of the furnace gases. This, of course, avoids a necessarily complicated CO_2 recorder, and instead uses a comparatively simple air-flow recorder. Such an air-flow recorder used in connection with a steam-flow recorder gives a very useful indication of the efficient operation of the plant, since if everything is in order the air used should be in proportion to the steam produced. Another case where simplification may be obtained is with one of the available systems of automatic feed water control, in which a delightfully simple device controls the supply of feed water. With this apparatus automatic compensation for heavy and light loads is actually more effectively made than could possibly be done with certainty by semi-automatic methods involving the use of more complex recording apparatus. These are but two examples showing that control in the boiler room is not necessarily unduly complicated or expensive to instal if all the possibilities are explored.

The Industrial Production of Insulin

By A. S. Wilson-Jones, B.A.

The production of insulin on a commercial scale has been described as one of the greatest achievements of British industrial chemistry. The problems involved were mainly of a chemical engineering nature, and the following illustrated account indicates how they have been overcome.

INSULIN is in a class by itself among the products of industrial chemistry. There is no other bio-chemical extraction which has to be carried out on such a large scale, and this fact, coupled with the necessity for producing insulin at the lowest possible price, makes the solution of the problem of its manufacture particularly interesting. The processes involved are, of course, purely chemical, so that on the industrial scale ordinary unit processes of chemical engineering are used. These have had to be co-ordinated with the greatest care with a view to the avoidance of all waste, and the efficiency of the method adopted is indicated by the fact that by its means the cost of insulin was reduced from 25s. to 2s. 8d. per hundred units. By the courtesy of Mr. F. H. Carr it is possible to reproduce for the first time a number of photographs of the plant situated on the premises of The British Drug Houses, Ltd., in London, where insulin is made in conjunction with Allen and Hanburys, Ltd.

FIG. 1.—REFRIGERATING CHAMBER WHERE THE GLANDS ARE FIRST FROZEN.

In order more clearly to understand the necessity for the individual stages in its manufacture it must be remembered that insulin is very readily destroyed by enzymes, particularly those found in the adjacent cells in the pancreas. It is precipitated by protein-precipitating agents, and it is sparingly soluble in water at its iso-electric point, but readily soluble at greater or less degrees of acidity. It is also soluble in alcohol, and 65 to 70 per cent. alcohol has been found to dissolve the minimum of the harmful enzymes present.

Cooling Arrangements

In order to prevent decomposition of the insulin by the enzymes which are necessarily extracted along with it, a considerable degree of cooling is required between each of the earlier stages. The refrigeration arrangements therefore form an important part of the plant. The low temperature is obtained in the first instance by means of an ammonia compressor. The compressed gas is then cooled to normal temperature by water, and it is characteristic of the care taken in the details of the plant that this water is used about the building for general washing-down purposes instead of allowing it to run to waste. The ammonia is then allowed to expand, and the cooling so obtained chills a solution of strong calcium chloride solution. This solution is then sprayed in a current of air, which is thereby cooled to a low temperature. The cold air then circulates in the refrigerating chambers.

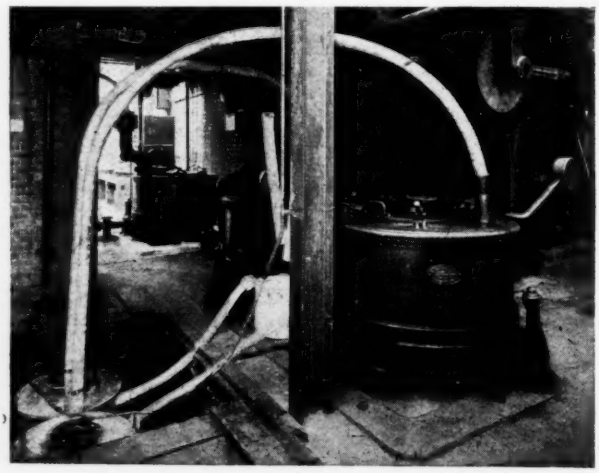


FIG. 2.—CENTRIFUGAL EXTRACTION OF INSULIN.

The pancreas glands are obtained from the slaughter-house as soon after the death of the animals as possible, and they are placed in enamelled trays and stacked in the refrigerating chamber. When frozen they are taken out and cut up into small pieces by hand. The pieces are put into the mincing

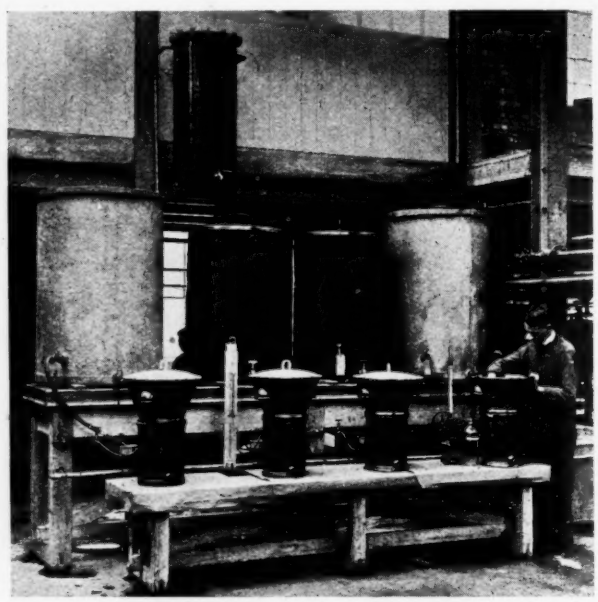


FIG. 3.—PRECIPITATION OF INSULIN FROM FIRST EXTRACT.

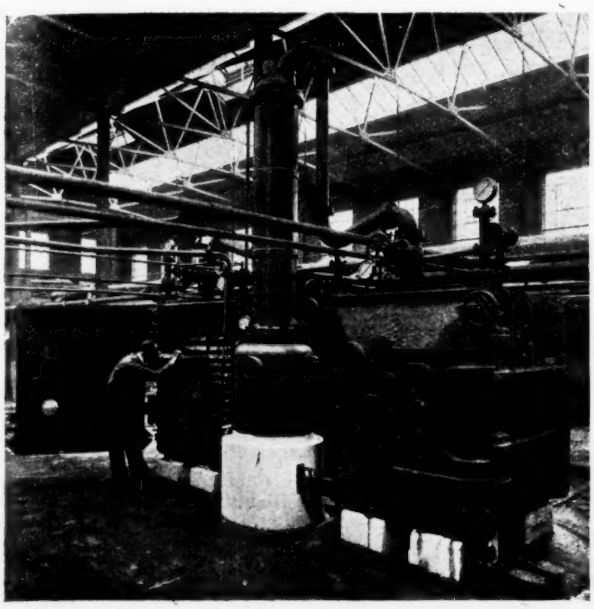


FIG. 4.—VACUUM DRIERS FOR RECOVERY OF ALCOHOL FROM RESIDUAL TISSUES.

machine, into which acidified alcohol is fed, so that the insulin may be set free from the tissues during the process. From the mincer the material passes to a grinding mill. After grinding, the material gravitates to the centrifuges, in which the extract is separated from the residual tissues. To avoid loss of alcohol through vapours being drawn away by the air sucked through the centrifuge, the receiver for the extract is covered over and a pipe is led to the basket, which is also covered. In this way all the air drawn through the machine simply circulates and no vapour is lost.

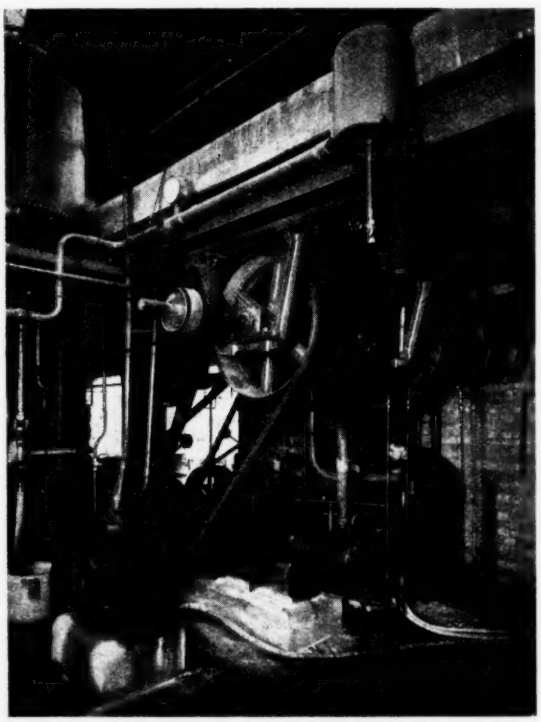


FIG. 5.—SINGLE STAGE VACUUM PUMP (LEFT) AND TWO-STAGE VACUUM PUMPS (CENTRE).

The extract is next clarified by cooling in tanks in the refrigerating chambers and then by passing through a high-speed centrifuge. The bulk of the extract is reduced to one-tenth in an evaporator under high vacuum. This allows the removal of a greater part of the alcohol without raising the temperature above 32° C. The fat is then extracted, and by now the volume of the extract is so much reduced that the later stages require smaller plant. The insulin is next put through a long process of purification, including precipitation with ammonium sulphate and with picric acid. At the present time the practice is to work batches of 500,000 doses (5 million units) in these later stages. The product is finally obtained as a white dry powder.

Recovery of Alcohol

The residual tissues of the pancreas contain a considerable proportion of alcohol, and this is removed by heating in large vacuum driers. The alcohol is collected in a receiver and is recovered in a way which will be referred to later. The dried tissues still contain the greater part of their original proteins, and they are of considerable value for manufacturing animal food.

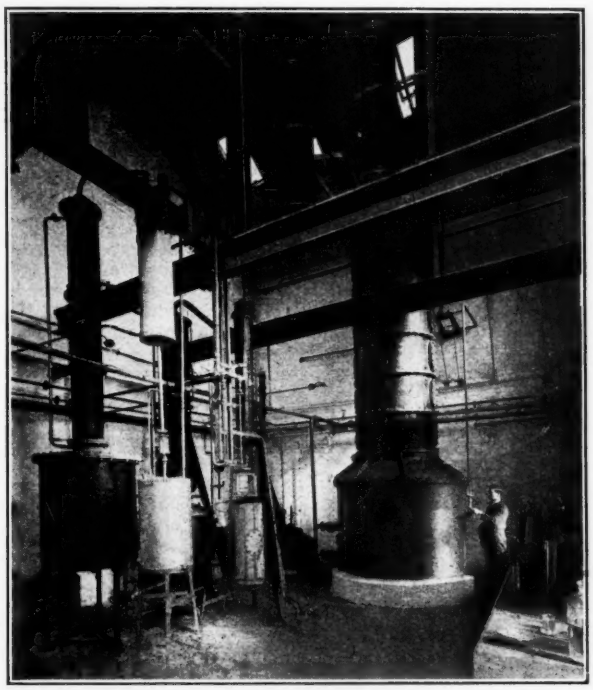


FIG. 6.—STILLS FOR RECOVERY OF ALCOHOL AND OTHER SOLVENTS.

A most important part of the plant is concerned with the recovery of the alcohol from the various stages. Wherever alcohol is set free there is a pipe leading to the main collecting tank, and the alcohol is either sucked or driven to this central point. In the case of the alcohol from the vacuum evaporator a proportion of this passes through the two-stage high-vacuum pumps used, and it is collected in a receiver containing adsorbent charcoal. This is then driven off periodically by heat and passed to the main receiving tank. It should be noted that all alcohol, of whatever strength, is led into the one tank, and that it is piped direct, wherever possible, from the point where it is collected. There is no handling in open vessels, and consequently a minimum of loss through evaporation. The alcohol from the tank is led by a pipe line to an adjacent building, where it is rectified, and passed into the storage tank at the correct concentration. A small test pipe is led from the off-take to a laboratory bench so that the strength may be readily and easily tested.

There are also in the same building stills for rectifying ether, acetone and petroleum, which are used in some stages in the process.

The carefully studied lay-out of the plant is particularly

noteworthy. In one corner of the building is the plant chemist's laboratory, where any experiments necessary in connection with the production may be carried out under proper conditions, actually on the spot. The whole of the stages in the manufacture can also be watched by the plant chemist owing to the convenient location of his laboratory.

Upstairs there is a large research laboratory where experiments are carried out on alternative methods of preparation and other matters connected with insulin.

A laboratory is fitted up for carrying out physiological tests at the factory, and Dr. Underhill, recently of St. Bartholomew's Hospital, has been appointed to take charge of this department.

At Messrs. Allen and Hanburys, Ltd.'s works the sterile solution of insulin is prepared under the direction of Mr. Norman Evers, assisted by an expert bacteriologist, and the carefully standardised sterile solution is packed in bottles under ideal conditions in a room built for the purpose.

The Chemical Engineer of To-day

By W. H. Coleman, F.I.C.

It is now some years since the American Institute of Chemical Engineers was founded, and this year we are expecting a visit of a party from this Institute to England. We are a curious people. Sometimes we are first in the field, as was the case with the artificial colour industry, and having started a good thing we have allowed ourselves to be outstripped in the race by others. At other times we have allowed others to make a start, and have been apathetic until it was forced on us to see that the matter was vital, and then we have turned to and out-distanced all our competitors. It seems as if we are to adopt this latter course in the case of the chemical engineer.

A little history may be useful here. Some time after the American Institute was in existence it occurred to several of the more active members of the Society of Chemical Industry—which was, by the way, in the very early stages nearly a Society of Chemical Engineering—that it would be a good thing if a section or group of the Society concerned itself more especially with the engineering side of chemical industry and the Chemical Engineering Group was formed. After some years of good work it was felt that it would be well to form an English Institute of Chemical Engineers, and so two or three years ago the English Institute was formed and now finds its place among our institutions.

Let us now consider what functions this Institute has to perform and how they are being carried out.

The work of the Institute appears to the writer to be threefold :—

1. To collect and enrol into one society all those who in this country have acted as chemical engineers.
2. To settle what qualifications are necessary for those who are to act as chemical engineers, and to form an authority which will decide if candidates are properly qualified.
3. To arrange and supervise the training which they must undergo who aspire to be the chemical engineers of the future.

These objects our English Institute is carrying out with a very considerable measure of success. Already we have courses in chemical engineering at some of our Universities, and many of our chemical engineers are supporting the Institute, though it can offer but little to them at present. It is to the future not only of chemistry and chemical engineering but to those of our country that we must look so that England may be able to be in the forefront not only in the older branches of engineering but in that of chemical engineering as well.

What is an engineer ? To the man in the street it often means a man who drives an engine, or who puts in electric bells, or makes laundry machinery. But what does it really mean ? We must go back some distance and find the real meaning. Many years ago, when warfare began to emerge from simple muscular hard hitting and to use contrivances for making the hits harder, men began to apply their brain power to the subject, and *la Genie* became a part, and the most important part, of every army. It was shortly found that the application of brain power was not only of advantage in war but could also be of use in peace, and *la Genie Civile*, or civil engineering, began to emerge. As our activities became more complex, so the opportunities of using brain power became greater, and the numerous branches of civil as opposed to military engineering came into existence, and to-day we may define engineering as that branch of the world's work which occupies itself with the application of brain power to the needs of everyday life, and the engineer as the man who does this work.

From this to the definition of the chemical engineer is an easy step. The chemical engineer is the man (or woman) who applies his (or her) chemical knowledge to the carrying out of those processes which are, or are believed to be, necessary for or useful to the community.

Let us for a few minutes consider what sort of a man the chemical engineer should be. First and foremost he should have a good general education. He must know as thoroughly as possible his mathematics, his physics, and his chemistry. Unfortunately he must also know those modern foreign languages in which other nations record their work. Finally, he must know his fellow men, because he must use them, and to use them he must know them, not in the old sense of exploiting them but in the real sense of bringing their activities to help him in his work—the most important (I had almost said the most awful) work of maintaining the ascendancy of our race.

For when all is said and done what is the work of our chemical engineers but that of the generals in the great war of man against the forces of nature. For the time is almost here, if it has not already come, when mankind must cease to squabble as to the titbits of the product of the chase and must combine to secure for all the means of life. And as chemistry is the science of the stuff of which the universe is made so the chemical engineer is the man who can turn that bit of this stuff over which we have some control to the uses of mankind.

Dr. A. W. Crossley on Bleaching Problems

Dr. A. W. Crossley, Director of the British Cotton Industry Research Association, lectured at the Royal Institution on January 23 on the application of science to the problems of the cotton industry.

On the subject of bleaching Dr. Crossley said that at the Shirley Institute laboratories new light had been thrown on mercerisation, for at 15 per cent. strength caustic soda solution, in which the maximum swelling occurred giving the best lustre, it had been found that in the individual hairs the outer layer or cuticle of each would stretch beyond a certain limit, and that if this was cut by a microrazor the inner cellulose bulged out. Thus mercerisation had a definite limiting botanical factor. Much valuable work had just been carried out on problems connected with bleachings. Cotton well bleached should be white but should not have suffered any deep-seated chemical changes such as would affect its physical properties or lower its strength also. Bleaching was carried out by means of oxidising agents and great care had to be taken as they attacked cellulose to form oxycelluloses and unlevel dyeing might result. The chemical tests that were used for determining the extent of this attack had been investigated, and it had been discovered what an important part the slightest change of acidity or alkalinity of the liquor played, and limits had been laid down within which safer bleaching might be carried out.

The fall in strength of the cotton due to such processes was followed by the lowering of the viscosity of its solution in cuprammonium, a method which had been made to give very useful indications. The bleaching of grey grounds to white when coloured stripes were present was another difficulty upon which help could be given to the industry. Thus, if the hypochlorite liquor was allowed to become in the least degree acid, a dye such as indanthrene blue turned green, while cibanone black became pink if the liquor was neutral, whereas it was quite fast on the cotton in the alkaline solution.

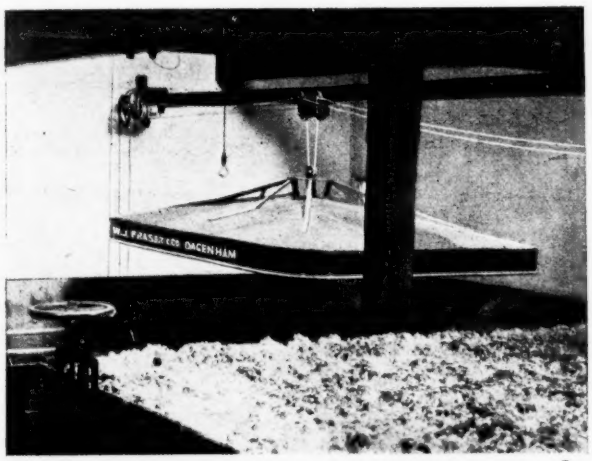
Chemical Engineering and Brewing

An Interesting Application of By-Products

In the old-established processes used in obtaining beer from fermented malt liquors, the fermentation usually takes place in open vats. During the fermentation a large volume of carbon dioxide is produced, which is, of course, allowed to escape. A certain amount of gas is retained by the liquor and gives to the resulting beer a certain amount of sparkle and taste, but when bottled beers are being prepared the gas naturally present is not sufficient for the purpose, and so the liquor is "carbonated" by the addition of further carbon dioxide under pressure. With the growing popularity of bottled beers many brewers actually have had to purchase considerable quantities of compressed CO_2 gas in order to supply their requirements. Though various isolated attempts were made to utilise the waste gases from the fermentation vats as a source of CO_2, we believe that the first successful plant for this purpose was designed some 20 years ago by a well-known firm of chemical engineers—W. J. Fraser and Co., Ltd., of Dagenham, Essex.

Recovering the Carbon Dioxide

In principle the plant consists of a collecting bell suspended over the fermenting vat, and a pump by which it is drawn away and compressed into a receiver. The gas can then be used as it is for the bottling of beer, so that the "carbonation"



Rectangular Collecting Bell, Showing Telpher Suspension over Vats

process is carried out with the actual gas from the beer itself, with a considerable improvement in the taste and aroma, compared with beer prepared by the addition of artificial carbon dioxide. Owing to the simplicity of the apparatus and the low cost of operating it, there is a considerable saving in using the recovered gas instead of purchasing artificial gas. One of the largest users states that the working cost of collecting the gas amounts to only 10s. per week.

The plant is supplied in different sizes ranging from the smallest, which collects 20 lb. of gas per hour, to the largest, which can take 120 lb. The pumps used are either single or double cylinder duplex machines, fitted with valve boxes having non-sticking valves, and provided with a deloading valve to facilitate starting. They may be driven either by electric motors or off existing shafting. The largest size requires about 6 h.p. when pumping against the highest pressures. Direct acting steam pumps are also used in some installations.

The collecting bells are made either round or rectangular in shape to correspond with the shape of the vats. They are constructed in copper or aluminium, and as only a portion of the vats actually contain fermenting liquor at one time, the bells are suspended from overhead girders, telpher-fashion, and can be run about easily to the vats actually in use. A governor is inserted between the bell and the pump in order to control the flow of gas. Sometimes covered-in type vats are used, and in that case the arrangements are modified slightly o allow working under slight pressure.

The receivers in which the gas is stored are constructed of mild steel and supplied with a manhole and fittings, and built generally according to boiler practice.

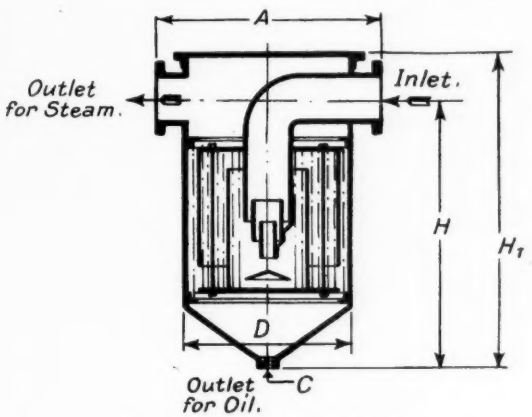
Manufacture of Pure CO_2

The natural gas obtained from the vats is only suitable for beer bottling, unless it is further treated. By means of a purifying plant it may be made suitable for mineral water manufacture, or compressed into receivers and sold as solid or liquid carbon dioxide. The purifying plant may vary in its nature according to the size and the quantity which it is desired to treat. The makers of the receivers, already referred to, have supplied a number of small plants for use at breweries for purifying the gas to make mineral waters. These plants have several interesting features, being entirely self-contained and automatic in action. They thus require very little attention and the cost of operation is low. A special purifying agent is used which can be used again and again by treatment in the regenerator which forms a part of the apparatus.

The "Drayton" Oil Separator

Removal of Oil from Condenser Water

In seeking for economy in works operation it is at once obvious that the recovery of steam and the waste heat from it should prove one of the most profitable means. Unfortunately, as is well known, the fact that steam from engines is contaminated with oil and dirt proves a great difficulty in the way of utilising waste steam. Many elaborate devices have been introduced from time to time to remove the oil from condenser water and render it suitable for return to the boilers. Many of these plants have been successful, but others less so, a particular difficulty with some types of oil separator being that in course of time they become fouled with oil and the efficiency is diminished. In bad cases it has happened that steam passing through a dirty oil separator has actually picked up more oil than it had on entering. The makers of the



The "Drayton" Oil Separator

"Drayton" oil separator—the Steam Fittings Co., Ltd., of West Drayton, Middlesex—claim to have entirely overcome the difficulty of fouling of the separator by doing without the usual rigid baffles which become coated with oil. Instead, there is an oil eliminating device which is kept in constant vibration by the passing of the steam, the oil in this way being prevented from accumulating. As a result the makers can guarantee the presence of as little as one-tenth of a grain of oil per gallon of condensed steam when operating over a prolonged period. The "Drayton" oil separators are normally of the form shown in the accompanying diagram, but users' requirements for other shapes can be met, as the system is adaptable in this respect. Standard separators are made from wrought steel and welded and fitted with a removable cover. The standard sizes are made to operate with quantities from 150 up to over 31,000 lb. of steam per hour, at 25° vacuum. An automatic discharge trap can be fitted at the base of the standard separators to remove the collected liquid.

Studies in Filtration

The following is a summary of a paper by Messrs. B. W. Clarke, S. G. M. Ure, and J. W. Hinchley read at the meeting of the Institution of Chemical Engineers on Wednesday. The paper presents an account of a portion of the preliminary work on this subject carried out last year in the Chemical Engineering laboratories of the Imperial College of Science and Technology, London.

FILTRATION might be defined as the separation of liquids from solid matter suspended in them by means of a porous medium which would allow the free passage to the liquid but would retain the solid particles. Filtration had been usually compared with flow through a large number of capillary tubes, and on this assumption the rate of flow through a cake would follow Poiseuille's law :—

$$\text{Rate of flow} = \frac{\pi (p_1 - p_2)\, r^4}{8 l \gamma_i}$$

where p_1 and p_2 were the pressures at the end of the tube, r is its internal radius, l its length, and γ_i the coefficient of viscosity of the liquid.

Hatschek in 1908, discussed the stereometric relations between the particles forming the cake and the pores in the filtering medium with regard to the arrangement which the particles would take up during deposition. Many interesting deductions were made and the conclusions arrived at were as follow : " The opinion seems to be widespread, and it is certainly superficially plausible, that increased pressure produces a harder drier cake, especially when filtration takes place in a closed space as in the chamber of a filter press ; in other words, increased pressure is supposed to reduce the percentage of voids and to bring the solid particles into closer contact. The short analysis of the formation of the deposit given at the beginning of this paper is probably sufficient to show this view to be quite unfounded. While particles are suspended in a liquid they are not subjected to unbalanced pressure, so that an increase in the latter cannot affect them. As soon as the particle reaches the septum or another particle already at rest it is exposed to an unbalanced pressure corresponding to the area over which it is supported. This pressure, however, whether great or small, always has the same direction or resultant and will, therefore, always tend to place the particle in the same position. When all the particles are in mutual contact, *i.e.*, when the 'cake' has formed, the pressure with which the particles are held together may be increased by increasing the pressure, but the structure of the deposit and the percentage of voids cannot be altered thereby. Needless to say those remarks apply only to rigid particles, and not to such as are flexible or plastic or capable of coalescing as, for example, the particles of paraffin in chilled petroleum."

In 1912 Lewis and Alny from experiments on a sludge derived the mathematical formula for filtration :—

$$\frac{dW}{dT} = K \frac{P^m}{V^n}$$

Where $\frac{dW}{dT}$ the rate of discharge of liquid through the cake.

K, m, and n are constants for any one experiment ;

P = pressure of filtration ;

V = volume of filtrate.

Dr. Sperry suggested a new mode of attacking the problem in which the rate of flow of a liquid through a cake was assumed to follow Poiseuille's law and to be directly proportional to the pressure of filtration, the cake being regarded as formed of a number of capillary tubes, in which case Poiseuille's law held. The rate might also be regarded as inversely proportional to the resistance to flow, which was made up of the initial resistance due to the press cloth, etc., and the resistance due to the cake, which would increase as the thickness of the cake increased.

The Structure of Cake

The structure of the cake could not be measured by the percentage of voids it contained as appeared to be assumed by Hatschek, unless each particle was assumed to have been a rigid sphere. Even then spherical particles of equal size could be arranged in ways to give from 25 to 47 per cent. of voids, and therefore it was obvious that although the percentage of voids might give useful information the shape of those voids and their position with regard to the direction of flow would have a considerable effect on the value of the resistance. It would be realised that cylinders of equal size could be arranged with the same percentage of voids to make the resistance either a small figure or infinitely large. Nevertheless the volume of the voids or the relations between the weights of wet and dry cakes offered important information. It was evident, however, that no air could be allowed to enter the cake before determining the volume of the voids by weighing a given volume of cake in the wet and dry states.

It was very convenient in comparing the general character of cakes of different substances, where the chemical composition was known with accuracy, to determine the solidity (d) of the cakes, *i.e.*, the fractional volume of the cakes occupied by the solids. Since ac was the weight of water in lbs. present in 1 cubic inch of cake the solidity d = ·0361—ac ; where ·0361 was the weight in lbs. of 1 cubic inch of water.

Details of Experiments

The substances chosen for the experiments were precipitates of magnesium carbonate, calcium carbonate, barium phosphate, and aluminium hydrate, and the following is a brief outline of their method of preparation.

Magnesium Carbonate.—A solution of magnesium chloride containing 10 grams of magnesium chloride $MgCl_26H_2O$ per 100 c.c. of solution was precipitated in the cold by the addition of a solution of sodium carbonate containing 10 grams of Na_2CO_3 per 100 c.c. solution. An excess of sodium carbonate was run in and after thorough stirring the mixture was allowed to stand overnight, so that the magnesium carbonate formed might become crystalline. Filtration was then carried out by gradually raising the vacuum to its maximum, the same time being allowed in each case. During filtration continual agitation must be employed as the crystalline solids easily separate from the mother liquor.

Calcium Carbonate.—In this case a solution of sodium carbonate containing 10 grams of sodium carbonate per 100 c.c. of solution was added, in excess, to a quantity of calcium chloride consisting of 10 grams of calcium chloride per 100 c.c. of solution. After agitation the mixture was left overnight before it was filtered under similar conditions to those described above.

Barium Phosphate.—To a solution of disodium phosphate Na_2HPO_4. $12H_2O$ consisting of 10 grams of this salt per 100 c.c. of solution, was added a barium chloride solution made up of 10 grams of $BaCl_2$ per 100 c.c. of solution and again allowed to stand overnight before filtration.

In every case the precipitation and filtration were carried out in the cold, at room temperatures between 10–12° C.

The results obtained for the structure of the cake with different pressures of filtration are tabulated below. In these experiments it was found that the vacuum must be raised slowly, as otherwise the cake tended to clog the cloth and vitiate the experiments. The vacuum was raised to 10 in. in 2 minutes, 15 in. in 3 minutes, 28 in. in 4 minutes ; except in the case of magnesium carbonate, which is a very free filtering substance and might be subject to 28 in. of vacuum at once.

TABLE I.

Pressures of filtration. In. of Hg.	lb. per sq. in.	Percentage of solids in the cake. Magnesium carbonate.	Mean.	Calcium carbonate.	Mean.	Barium phosphate.	Mean.
		27·2		53·8		64·0	
		27·2		53·3		63·3	
28	13·2		27·5		54·1	64·8	63·8
		28·0		54·3		63·7	
		27·5		55·1		62·9	
				54·2		63·2	
20	9·3			55·0	54·6	64·4	63·7
				54·6		63·6	
		27·3		54·1		64·4	
15	6·85	27·8	27·5	53·7	53·9	62·8	64·0
		27·5				64·6	
12	5·4					63·6	63·6
		27·6					
10	4·4	27·4	27·1				
		26·8					

These precipitates were either crystalline or composed of rigid particles and therefore the generalisation of Hatschek should apply to them. A consideration of these figures seemed to confirm his conclusions, since there was no evidence of any consolidation of the cake under increasing pressure of filtration, so far as filtration under vacuum was concerned. Experiments were also carried out to determine whether the thickness of the cake or the composition of the liquid to be filtered affected the structure of the cake in any way. No effect was observed in either case under the conditions of the experiments, the figures in the following table being typical of the results obtained.

TABLE 2.

Thickness of cake. in inches.	Percentage of solids in the cake. Magnesium carbonate.	Calcium carbonate.	Barium phosphate.
2	27·9	55·1	63·6
1¾	26·6	—	—
1½	27·8	54·4	63·7
1¼	—	—	63·2
1	27·6	53·3	—
¾	27·5	54·2	63·2
½	27·2	55·3	64·6

In investigating the effect of the composition of the prefilt on the structure of the cake, prefilts having varying amounts of solid matter in suspension were prepared by, in the case of calcium carbonate and barium phosphate, resuspending the dried cakes in water, but when experimenting with magnesium carbonate strong suspensions were prepared by allowing the precipitate to settle out in its mother liquor and then decanting some of this liquid. The composition of the prefilt was determined either (*a*) by weighing the dried cake and measuring the volume of the filtrate obtained during its formation; (*b*) by evaporating a known volume of the prefilt to dryness and thus determining the amount of solid matter which it had in suspension.

In the actual work the second method was adopted, the first method only being employed as a check. From the figures given in Table 3 it will be seen that the composition of the prefilt does not apparently affect the structure of the cake.

TABLE 3.

Magnesium carbonate. % of solids.		Calcium carbonate. % of solids.		Barium phosphate. % of solids.	
In liquid.	In cake.	In liquid.	In cake.	In liquid.	In cake.
15	28·6	—	—	18·7	64·2
12·5	27·6	11·4	54·5	16·2	64·4
9·5	29·6	—	—	12·3	64·0
7·0	26·6	4·2	54·6	7·0	64·4
5·0	27·9	—	—	5·5	63·2
3·0	27·8	3·1	54·1	4·5	63·7
2·0	27·4	—	—	3·0	63·8
1·0	27·2	1·1	53·8	2·1	65·2

For comparative purposes a series of experiments was carried out using a small plate and frame filter press. Four sets of frames, each set consisting of two frames, were used to produce cakes of 2 in., 1½ in., 1 in., or ½ in. in thickness. The prefilt and the wash water were contained in two monte-jus and were transferred to the press by compressed air. The pressure under which either filtration or washing was carried out was recorded by pressure gauges mounted on air vessels situated at the respective inlets of the press. The experiments in this part of the work were carried out with precipitates of calcium carbonate prepared in the manner described above and washed by decantation. Afterwards filtration was conducted at definite pressures, the volumes of the filtrate being read at regular intervals. When the rate has fallen to less than 10 c.c. per minute, the filtration was stopped and the unwashed cake removed, and the percentage of solids found as described above. The percentage of solids was the ratio of the weight of the dry cake to the volume of the filtrate, except in the case where decomposition occurred on heating. During the progress of filtration the prefilt in the monte-jus was kept in agitation by compressed air. The following table gives the result of filtering a prefilt containing approximately 10 per cent. of solid material.

TABLE 4.

Pressure of filtration, lb. per sq. in.	6·0	15·0	20·0	30·0	40·0	50·0	60·0
Percentage of solids in the cakes	61·9	63·3	63·0	63·6	64·4	64·6	64·9
	62·4	63·0	63·4	63·6	64·4	64·6	64·8
	62·5	63·0	63·1	63·7	64·5	64·7	—
	—	—	63·5	63·6	64·4	64·7	—
Mean value	62·3	63·1	63·3	63·6	64·4	64·7	64·9

These figures showed a definite progressive increase in the percentage of solids in the cake as the pressure of filtration was increased, and disproved the contention of Hatschek. This increase might have been caused by the fact that in an enclosed space like the chamber of a filter press, the particles were not free to arrange themselves in the ideal position discussed by Hatschek, the actual arrangement being dependent upon the pressure of filtration. With higher pressures therate of flow of the filtrate was increased and therefore the particles in suspension in the liquid approached the particles deposited in a haphazard manner to form the cake, at a higher velocity, and therefore they possessed a large amount of kinetic energy, and should therefore be more able by their impact to cause the particles already deposited to rearrange themselves in a position of more stable equilibrium.

The next point investigated with the filter press was the effect of varying the amount of solid matter in the prefilt. These suspensions were prepared in the manner already described, and the filtration was carried out at a pressure of 20 lb. per sq. in. in each case, the results obtained being as follow :—

TABLE 5.

% of solids in liquid	15·0	11·5	7·5	6·4	4·5	3·9	2·2
% of solids in cake	62·9	63·2	63·5	64·6	64·9	65·0	65·2

This table showed that there was a progressive increase in the percentage of solids in the cake as the percentage of solid matter in the prefilt diminished. Obviously the time required to form the cake increased as the strength of the prefilt diminished. This increase in the percentage of solids in the cake might be due to the fact that tap water was used in increasing quantities to produce the weaker suspensions. The added water might reduce the size of the particles and so permit a larger number of small particles becoming wedged in the interstices of the cake, or a better settlement of the solids in the cake.

Formation of the Cake

Whilst determining the proportion of solids in the cake the rate of formation of the cake was also measured, by recording at definite intervals the volume of the filtrate passing. The graphs thus obtained resembled the time-discharge curves of a filter press, but did not indicate any consolidation period. In obtaining data for these graphs either

(*a*) The composition of the prefilt may be kept constant and the filtration carried out at various pressures; or (*b*) The pressure may be kept constant, and the filtration be made on a series of prefilts carrying various amounts of solids.

Fluctuations in the pressure, the use of cloths a second time after washing and the absorption by the cloth of the impurities from the washing water would appear to increase rather than diminish the cloth resistance or give an opposite effect to that shown by the curve.

Canadian Cobalt

AN official communication on the mining activities of Canada states that the production compares favourably with previous figures. The silver mines at Cobalt, South Lorrain and Gowganda continue to be the chief source of the world's supply. Hitherto cobalt has been obtained almost entirely as a by-product from the silver ores, but during the past year there has been a small production of ore primarily for its cobalt content, the silver being too low to justify its mining for that metal.

A remarkable increase has been made in the non-ferrous metal production. There has been a demand for molybdenum concentrates during 1924 and taken generally the mining industries can report progress. The great possibilities of the mining and metallurgical industries of Canada are becoming more widely known and recognised.

Chemical Protection of Fabrics Against Moths

New Process Explained to Dyers and Colourists

There was a large attendance on Friday evening, January 23, at Australia House, to hear a lecture by Mr. J. Craft on "The Incorporation of Eulan into woollen textiles and other fabrics to ensure permanent protection against moth damage," before the London Section of the Society of Dyers and Colourists. Dr. C. Dorée presided.

A German Chemist's Invention

HAVING spoken of the inefficiency of the present methods of moth prevention, Mr. CRAFT explained that Eulan was the invention of Dr. Meckbach of the Bayer Aniline Company. Some years ago the Professor's mother gave him as a wedding gift an old-fashioned sofa which was covered in green rep, believing that moths would not eat anything of a green colour. To the surprise of the doctor, in two years the sofa became infested with the grubs. This incident set him thinking, and he started experiments of a simple nature which were afterwards developed by the Bayer Company's research chemists on an enormous scale. For these first experiments in 1917 about 100 pieces of cloth were placed in a tin-lined case, previously provided with a number of moth-infested rags.

Each piece had been treated with a different chemical in the proportion of one per cent. of its weight. At the end of six months, on opening the case it was found that every pattern was more or less moth-eaten, with the exception of one that had been dyed with the so-called Martius yellow, one of the first coal-tar dyes discovered as far back as 1864, and, apart from picric acid, the only yellow artificial dye employed in the wool industry until fifteen years later, when it was replaced by Naphthol yellow.

As every woollen material dyed green forty or fifty years ago contained a considerable proportion of Martius yellow, Dr. Meckbach realised the grounds for the old belief that green material would not be attacked by moth. Thus, such a simple occurrence as a wedding present ruined by moth led to the discovery of Eulan. Beyond this discovery the experiments of 1917 and the following year were not very fruitful, but they confirmed the firm in their determination to find a preparation that should be colourless and odourless, that could be absorbed in small quantities from aqueous solutions, and would be permanently combined with the wool so that the treated materials would be absolutely immune from moth attacks without destroying any of the valuable properties of wool.

Biological Research

As the literature concerning the clothes moth was very limited, and partly wrong, it was necessary to determine a number of biological details, one of which was the means of preventing the satisfactory nutrition of the pest. At the same time, provision had to be made for the production of a large number of moth eggs. Moth culture was started in the laboratories on such an extensive scale that, during one summer alone, it was necessary to collect 240,000 eggs. For the last five years at least 1,000 eggs a day have been required for research purposes. The services were therefore secured of Professor Titschack of the Zoological Institution of the University of Bonn. For two and a half years the Professor was occupied with the study of the life and habits of the clothes moth, the results of which have been embodied in a book of 168 closely printed pages.

Three different classes of moth attack wool or any other material containing Keratin—the so-called clothes moth, fur moth, and the tapestry moth; the latter, which is rather rare, consuming hair. The most destructive is the clothes moth. The female clothes moth on an average lays 150 eggs, and before they are laid she is so weighed down that she hardly flies at all, but she can crawl over a lot of ground. It is therefore of very little use killing a moth that is seen flying about, as, with few exceptions, it is always the male. Eight to ten days after the depositing of the eggs the tiny white grub appears and starts immediately on its quest for food. Simultaneously it spins a cocoon from its own silk, covering it with minute fibres of the material on which it found itself; the whole forming a tube or casing around the insect, which, being the colour of its surroundings, is hardly visible.

As illustrating the power of mimicry possessed by the grubs, Mr. Craft showed on the screen a specimen of casing that was red and blue in colour, the insect having fed on a carpet of these two colours. Other examples were thrown on the screen showing various kinds of material, some of which had been Eulanised, and therefore completely protected, and others that had not been treated, which were destroyed.

The fecundity of the moth is so great that the issue of a single female can destroy something like 100 lbs. of wool in a year. She produces four generations in that time. The grub stage may last ninety days and afterwards the insect develops into a chrysallis, from which, in periods varying from fourteen to forty-four days, the moth emerges; the time varying according to the temperature and other circumstances.

Method of Application

The method of applying Eulan varies with the materials that are to be treated. The treatment should be carried out either in the last wet process or in the separate final passage through the Eulan solution before drying. The process is usually cold, but, if it is desired, it may be performed with a hot solution. The length of time necessary thoroughly to impregnate materials depends upon their weight, thickness, etc. The strength of the solution does not decrease while in use, but merely the volume. The solution is prepared some hours before it is required for use in a wooden vessel fitted with a tap about six inches from the bottom, and with a wooden bung nearer the bottom, so that the slime and sediment may be cleared out occasionally. A stock solution of double strength to the working solution is first prepared. The Eulan having been mixed into a paste with a little cold water, sufficient water is then added to form a liquid which shows a strength of one and a half ounces to the gallon. The liquid is brought to a boil by means of an open steam-pipe, and the clear liquid, after the sediment has settled, is then drawn off as required. Eulan can be used by the manufacturers either in a neutral state or with the addition of sulphuric acid for woollens, or formic acid for unions. Fabrics can also be treated by finishers, to whom they may be sent by merchants or tailors. The finishing usually consists of shrinking or waterproofing, either of which operations can be combined with the Eulanising process. Mr. Craft stated that waterproofed materials are not free from moth attack as is often imagined.

He then described the methods of treating yarns, felts and other heavier materials. Most modern dye stuffs, he said, will stand washing, but there are cases, especially with imported carpets, where fast dyes have not been used, and the only safe way of treating such is by dry-cleaning with the benzine soluble Eulan. The benzine soluble Eulan has been introduced for the purpose of permitting the application of the preparation to materials during the dry-cleaning process. In this way it can be applied to woollen underwear, flannel for suitings and other domestic purposes.

Before closing, Mr. Craft alluded to the damage done in the aggregate by moths. It is impossible, he said, for anyone to give reliable figures, but Dr. Meckbach estimates that the annual loss of wool alone is at least 10,000 tons, whilst an up-to-date American puts the total annual damage at about £40,000,000. A much more conservative estimate concerning damage in this country every year puts it at about £1,000,000. Alluding to the demand that was set up for fast dyes, until it came to be taken for granted that aniline dyed materials were necessarily fast, Mr. Craft predicted that before long it would be tacitly assumed that all materials had been moth-proofed.

An interesting discussion followed, and the proceedings closed with a vote of thanks to the lecturer, proposed by Mr. Newbury and seconded by Mr. C. Eastman.

Torsion Balances

IN our issue of January 3 mention was made of the "H.B." Torsion Balance. Torsion balances are now manufactured in Great Britain, and a recent circular (No. 168B.) issued by A. Gallenkamp and Co., Ltd., 19 and 21, Sun Street, Finsbury Square, London, E.C.2, includes an illustration of the instrument. A full list of apparatus required for the estimation of sugar in the blood by various methods is given, together with current prices.

Appointments for Chemists

Low Percentage of Qualified Men Unemployed

MR. G. W. MARLOW, B.Sc., F.I.C., gave an interesting discourse to chemical students of the Northern Polytechnic, London, on Tuesday, on the subject of "Chemical Appointments." Dr. T. J. Drakeley, in introducing the lecturer, said that some of the audience hoped to hear something useful about chemical appointments as so far they had been unable to find any.

Mr. Marlow, in opening, said he would confine himself to post-graduate appointments, and mentioned, in passing, that it seemed to him unfortunate that a man who had failed to obtain a degree should be able to take up work as a chemist. Such a thing would not be possible in other professions. Coming to the actual figures of qualified chemists at present unemployed, the latest returns of the Institute of Chemistry showed that at the moment there were 18 Fellows and 141 Associates actually out of work. As these 159 were out of a total of 4,624 members of the Institute they represented only 3·4 per cent., which, in view of the present bad times, could not be considered very bad when compared with other professions and industries. Last year the percentage was considerably higher, being 4·5.

Choosing a Special Branch

Students were often in doubt as to what branch of chemistry they should choose as their special subject, and Mr. Marlow advised them to follow, if possible, the branch in which their school specialised. Thus students at the Northern Polytechnic would choose rubber chemistry because it was taught there as a special subject, and people in the rubber industry knew of the value of the training there.

With regard to the distribution of appointments, it was a rather interesting fact that 23 per cent. of those made through the Institute were for posts abroad. Another point of interest was the fact that the greatest number of appointments were made for chemists for work on foodstuffs in one way or another, the so-called chemical industries coming second on the list. After that came the paint and varnish industries, then the bio-chemical industry mainly concerned with brewing, then rubber, and so on. A considerable number of the vacancies arising were only notified to the Institute, which was a very strong argument for belonging to that body.

Mr. Marlow then gave some straightforward tips on how to make application for posts. At the present time there were on the average 40 to 50 applicants for any appointment of value. It was essential if the first application was to be considered at all that it should contain a carefully arranged list of qualifications, which should always be typed. A short covering letter in the applicant's own handwriting was also desirable. If the candidate was selected for an interview there were many little points to be remembered. For instance, chemists had been known to come direct from their laboratories to see their prospective employers without troubling to wash their hands. (Laughter.)

Factors to Consider

When it came to considering an offer there were a number of factors to take into consideration. Low salaries should not be accepted unless there were compensating advantages in the way of good prospects of advancement. The Institute had at one time recommended a minimum of £300 per annum for chemists without any experience, but it was not always politic at the moment to stand out for this figure. For posts abroad it was desirable to get in touch with someone who knew the country and find out the cost of living before accepting the salary offered. Both the Institute and Government Departments made a point of introducing prospective employers to men home on leave from the countries concerned. In countries where the exchange was liable to fluctuate it was very desirable to see that the salary was paid in sterling.

Under an old statute all agreements for a year or over must be in writing and bear a stamp. A letter setting out the main terms of the appointment, together with a letter of acceptance, constituted a legal contract.

As to the period for notice of termination, it was impossible to lay down a definite figure for all cases. For a young man without experience a month was not unreasonably short, but a man who had worked 20 years or so for one firm would expect at least six months.

Restraining Clauses and Secret Processes

Mr. Marlow then referred to the restraining clauses usually inserted in chemical contracts. These bound a man not to work in the same industry for a certain period after leaving his post. Chemical manufacturers nearly all believed that secrets in their processes should be protected in this way, and acceptance of the restraining clause made for confidence between the chemist and his employer, although as matter of fact the secrets were often more imaginary than real. In a recent case where certain chemical works were amalgamated, he said that though a great deal was made of the advantages that would be gained by pooling the secrets, it was actually found that the increase in knowledge by any one firm was practically nil. However, he thought there was little ground for objection to the restraining clauses. Most employers would allow a "consideration," in the form of an agreement to pay a certain sum of money on dismissal of the chemist in view of the fact that he was restrained from working in the industry in which he was experienced.

Another point mentioned by Mr. Marlow was that of income tax deductions for subscriptions to societies. This was allowable, but it was easier to prove to the assessor of taxes that these subscriptions were essential to the profession of the chemist if a clause was inserted in the contract with the employer that the chemist should continue his membership of certain societies.

At the conclusion a number of questions of detail were asked by the students, and the usual vote of thanks was carried by acclamation.

The Structure of Atoms

Lecture by Dr. Main Smith

THE eighth of the series of public lectures on "Atomic and Molecular Structure," by Dr. J. D. Main Smith, was given on January 21 in the Chemistry Department of the University of Birmingham, the lecture relating chiefly to the orbits of electrons in atoms. An account was given of Sommerfeld's extension of Bohr's theory of dynamic atoms, with electrons in circular quantised orbits in electric fields, to include electrons in elliptic orbits, by analogy with astronomical bodies in gravitational fields. Sommerfeld showed that the increase and decrease of electron speed in approaching and receding from the nuclear focus necessitated, in the theory of relativity, a corresponding increase and decrease in electron mass. This variation in mass caused the circulating electron to fall slightly out of the proper elliptic orbit, so that the orbit was that of an ellipse slowly rotating in its plane around the focus as centre. This precession of the ellipse made a slight total addition to the energy of the electron as compared with one in a circular orbit, and so caused the spectral lines due to electron transitions from elliptic outer to inner quantum orbits to be separated from those due to circular orbits. This "fine structure" of lines was later experimentally realised, and there can be little doubt that Sommerfeld's elliptic orbits and the "relativity effect" are realities in atoms.

The lecturer, however, showed that Sommerfeld's relativity effect of a planar precession of orbits is an impossible conception in chemistry, for valency directions in atoms are definitely known to be fixed in space and render impossible any planar rotation of the orbits of valency electrons. It was shown that the relativity effect could readily be provided for if precession took place out of the orbital plane, the electron thus moving in a fixed domain in the atom on the surface of an imaginary solid ellipsoid obtained by rotating the orbit about the axis fixed along a radius of the atom. An account was also given of Professor Morgan's theory of Cassinian oval orbits for electrons shared between two atoms in non-ionisable chemical combination. It was shown that these orbits being fused circular orbits are derived from equipotential surfaces and thus free from the relativity effect. An extension of the theory to fused elliptic orbits necessitated a relativity effect, and though Sommerfeld's planar precession was here also impossible, the lecturer's spatial precession about the fixed axis was fully applicable.

The lecturer showed how the "ether hole" and ether shell theory outlined in the previous lecture rendered possible a physical interpretation of a number of mysteries for which no adequate explanation had yet been advanced, the rectilinear

propagation of transverse light waves with spherical wave fronts, the absorption of light energy by electrons and its conversion into kinetic energy of electrons, the infrequency of this absorption by apparently identical electrons, the reverse conversion of energy of motion of electrons into light energy, the collapse of a large spherical light wave on movement of an electron out of an ether shell, and the non-radiative properties of Bohr orbits.

New British Chemical Standard

THE headquarters of the British Chemical Standard movement announce the issue of the first of a new series of standards, viz., Iron Ore "A" (hematite type) having the following standardised figures:

Sample dried at 100 to 110° C.

Iron	58·19 (0·12 per cent. insoluble).
Phosphorus	0·056
Silica	8·14
Sulphur	0·066

In due course a complete analysis of the standard will be reported.

The standard has been specially prepared to meet the need for a widely recognised sample for checking analyses of cargoes of iron ores by chemists representing buyers and sellers, and for standardising volumetric solutions such as pot. di-chromate, etc. As usual the analysis has been conducted by a number of qualified independent analysts, works chemists, etc. (14 in all), who have had special experience in this class of work and who represent the different interests involved in the wholesale merchandising of iron ores. Bottles of the finely ground standard material may be obtained from 3, Wilson Street, Middlesbrough, at a fee estimated to be sufficient to cover the cost of preparation. The three usual sizes are provided, viz., 500 gram, 100 gram and 50 gram. A certificate giving the names of the analysts collaborating, together with full notes on the methods employed, and a detailed list of individual analyses, will be supplied with each bottle.

Instruments for Boiler Control

An Interesting Series of Catalogues

A SERIES of catalogues issued by Industrial Combustion Engineers, Ltd., contains a number of very full descriptions of various recording instruments for use in the scientific control of boiler plant. These instruments are available for the indication and recording of such variables as temperature, steam and water flow, furnace draught and so on.

Catalogue 1 describes various forms of the Bailey boiler meter, which is a most ingenious combined instrument, capable of recording a number of variables simultaneously on a single chart, utilising different coloured inks. The steam flow is indicated by a red line, which measures the actual amount of steam being produced. An ingenious arrangement is the air flow meter, which by means of a blue line indicates the efficiency of the boiler operation. As air is virtually a fuel, when everything is correctly adjusted the proportion of air drawn into the furnace should vary with the steam produced, and in the Bailey meter the blue air line is arranged to coincide with the red steam line under these conditions. Any separation between the red and blue lines indicates at once some waste in operation, such as an excess or deficit of air, or leakage of steam. By this means a CO_2 recorder is rendered unnecessary, and thus an always complicated piece of apparatus is avoided

Recorders of flue gas temperature and furnace draught may also be incorporated if desired in the same instrument, which takes the form of a particularly neat casing, easily fitted to the boiler plant.

A second catalogue describes more fully the flow meter portion of the recording apparatus. This works on the principle of measuring and recording the pressure drop produced when the fluid passes a slight constriction in the pipe. The constriction is obtained by inserting a thin ring of metal in any flanged joint, thus obtaining a true venturi effect without impeding free flow. Connection is made to the recording apparatus by ¾ in. brass pipe.

Other catalogues describe various forms of indicator for furnace draught at different points in the plant, and for recording flue gas temperatures. All the instruments are very fully described, and the catalogues are worthy of close study by all who are interested in the control of boiler plant. We believe that the agents for the Bailey meters in this country—the Industrial Combustion Engineers, Ltd., Astor House, Aldwych, W.C.2,—will be pleased to forward copies to readers who are interested.

Goods Map for Traders

FOR the assistance of manufacturers and traders throughout the British Isles, the London Midland and Scottish Railway has issued as a booklet a classified list of their goods stations in 2,592 towns, together with a large key map, 3 ft. by 2 ft., showing their positions on the system. In addition, information is given regarding bonded stores, warehousing accommodation, etc., with an offer of help in the finding of factory sites adjoining railway lines suitable for any manufacturing purpose.

Lord Leverhulme at Duala, W. Africa

Sport & General

LORD LEVERHULME, in the course of his West African tour, received a presentation from native school children at Duala. Mr. H. Bell, manager of the Niger Co., is accompanying Lord Leverhulme on his travels.

Institute of Metals

THE annual general meeting of the Institute of Metals will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1, on Wednesday and Thursday, March 11 and 12, commencing each day at 10 a.m. Twelve communications are due for presentation at the meeting. The annual dinner will take place at the Trocadero Restaurant, on Wednesday, March 11, at 7 p.m. Amongst those who have accepted the Council's invitation to be present at the dinner are Mr. Neville Chamberlain (Minister of Health), Lord Morris (Vice-Chairman, Imperial Mineral Resources Bureau), and the presidents of many kindred societies. Ladies will be present, Mrs. Neville Chamberlain accompanying the Minister of Health. Separate tables—seating seven persons—will be provided, thus facilitating the arrangement of parties. Tickets, price 15s. each, can now be obtained, and tables reserved, on application being made to the Secretary, 14, Members Mansions, London, S.W.1. There has just been issued the thirty-second volume of the Journal of the Institute of Metals—a book of 832 pages. It includes thirteen communications presented at the Autumn Meeting, the May Lecture, the Autumn Lecture, the Seventh Report to the Corrosion Research Committee, and an Abstracts Section.

Members and Students elected as a result of the next Ballot —which closes at noon on February 25—will be entitled to membership until June 30, 1926. Membership particulars can be obtained from Mr. G. Shaw Scott, M.Sc., 36, Victoria Street, Westminster, London, S.W.1.

Indian Research in Lac

(From an Indian Correspondent.)

The Department of Bio-Chemistry of the Indian Institute of Science has been carrying on research in lac for some time past. An experimental plantation in the Mysore State has been provided, where research students carry on investigations. One result has been that erythrolactin, a derivative of anthraquinone, has been identified as the colouring matter of the ether soluble portion of the lac resin. Not more than a few grams of the substance could be obtained from five kilos of ground lac resin. A new process of washing lac and utilising the by-products has been perfected. Lac is ground and washed in one operation, yielding very concentrated wash liquors containing the dye and wax, which can be precipitated by calcium chloride. The dye-cakes thus obtained have a high percentage of wax. It has been possible to standardise the process of bleaching lac, and the product has been tried with satisfactory results.

Other Researches

Some other researches in Bio-Chemistry conducted at the Institute may also be mentioned. The Physiology of the acetone-organism is under study, and so far it has been ascertained that the organism requires a carbohydrate, primarily starch and an insoluble vegetable protein for food. It does not attack soluble protein and amino-compounds do not enhance its activity. The reaction of the medium is important, the best results being obtained with a moderate initial acidity. Calcium carbonate has an inhibitory effect.

Experiments are conducted to determine the nature of the amylase present in the organism. Glucose is invariably the sugar formed from starch, maltose or dextrine. No dextrine could be observed as an intermediate product during starch hydrolysis.

The difficulties experienced in fermenting mahua flowers by this organism are due to an inhibitory effect of the tannins. Another adverse factor is the absence of insoluble protein in the mash. The residue after extracting soluble matters from the mash yields 3·4 per cent. of acetone on fermentation and may be fermented when mixed with starch. The mahua waste after yeast fermentation is unfermentable. Symbiotic fermentation of mahua waste with yeast gives a 6 to 7 per cent. yield of acetone (on the total weight of solid matter taken).

Mahua Oil

The work on the changes accompanying the development of oil in the seeds of *Bassia longifolia* has been completed. Periodical chemical analyses by ordinary methods have been correlated with the micro-chemical examination of carefully prepared sections. The results generally are in accordance with those of previous workers on allied problems.

In particular it has been found that up to a certain stage of development there exists an intimate connection between the changes in the seed and those in the husk or pulp, after which they become independent. There is evidence that the oil is formed in the seeds at the expense of carbohydrates and possibly of tannins. At the outset free fatty acids are formed and are later converted to glycerides. In the husk, initial formation of sugar with subsequent increase in starch is indicated. The proportion of proteins in the seeds shows little variation, while in the husk the nitrogen percentage is found to rise to a maximum and then decrease.

Fourth Faraday Medal Award

The Council of the Institution of Electrical Engineers has made the fourth award of the Faraday Medal to Sir Joseph J. Thomson, an honorary member of the institution, and Master of Trinity College, Cambridge.

The Faraday Medal is awarded by the council of the institution not more frequently than once a year, either for notable scientific or industrial achievement in electrical engineering or for conspicuous service rendered to the advancement of electrical science, without restriction as regards nationality, country of residence, or membership of the institution.

Sir Joseph Thomson's publication in 1897 of his discovery of the existence of electrons and their emission from hot bodies was one of the fundamental stages in making possible the realisation of wireless telegraphy.

Reviews

The Manufacture of Chocolate (Die Schokoladenfabrikation, in German). By Dr. P. Zipperer; revised by Dr. H. Schaeffer and Engineer Schröder. Berlin: M. Krayn, 1924.

Chocolate and cocoa are discussed in this book from the agricultural, technical, and business point of view, with a sufficient thoroughness to offer something useful to specialists of any branch of the subject. The chemical and engineering parts of the book deal with the roasting and shelling of the cocoa bean, the various methods of grinding, mixing, manufacture of fancy chocolate, cocoa, "soluble cocoa," additions, adulterations and analysis. The book is well illustrated and provided with a number of useful tables.

The most interesting part deals with the roasting and grinding of the cocoa bean—the fundamental processes on which the quality of chocolate depends. The roasting process is so little understood that it would be futile to criticise the writer's view on the subject. In the section on grinding machinery a range of mills is discussed, from the common edge runner to granite roller mills having as many as nine rollers. The author half-heartedly reiterates the view that stone mills are more suitable than those made of iron for the best chocolates. This view, which is supported by at least one firm of manufacturers of world renown, is in reality not based on the imperfection of the iron machinery; workmen *will* employ on the latter high pressures and speeds, which frequently result in burning and loss of aroma; as no stone dust is formed, a much purer product ought to result. The part of the book dealing with analysis is also useful. Unfortunately, the latter suffers from lack of reference to English literature; since in no country does commercial analysis stand on so high a level as in Great Britain. The chapter on legislation is interesting, although Great Britain is not mentioned, perhaps, because in England chocolate may include any good wholesome food materials. However, the British manufacturer and merchant will benefit from the knowledge of the laws which govern the specifications for chocolate and cocoa in other countries.

In conclusion, we may safely state that the book is one of outstanding merit and should prove of great service to everyone connected with these industries. S. P. S.

Cotton Cellulose: Its Chemistry and Technology. By A. J. Hall, B.Sc., F.I.C. London: Ernest Benn. Ltd. Pp. 228. 30s.

Since the classic researches of Cross and Bevan commenced over thirty years ago, a large number of investigators have succeeded in revealing a new world in the seemingly inert cellulose molecule, a world as yet only partially explored, but which has considerably influenced some of our greatest industries, those of cotton, artificial silk, and paper. Up to the present, however, little has been done to co-ordinate systematically and edit the important results obtained, and for this reason the compilation of a work like the above renders considerable service to all scientific workers in this field. In the pretace the author states that his aim has been to provide a comprehensive and yet concise view of our present knowledge of cellulose chemistry, and he has brought together and classified the results of numerous investigators in a very complete manner, and provided a book which will serve as a most valuable reference to all interested in this branch of chemistry.

After dealing in general with cotton, its structure and pure fication, the author gives a very full account of the reactions of cellulose with alkalis, acids, oxidising agents and other various reagents. One of the most interesting chapters is that dealing with the artificial silks, and it includes two very interesting and practical tables, showing those dyestuffs capable of producing even shades on viscose—a difficult matter in practice.

A special feature of the book is the large number of tables dealing with various properties of cotton and cellulose with different reagents under varying conditions. These tables are separately indexed and thus made more easily available for reference. The author is to be congratulated on having obtained some very clear and self-explanatory photographs illustrating dyeing machines, etc., which enhance the appearance of a volume already well bound and well printed.

L. G. L.

From Week to Week

SIR WILLIAM POPE contributes an interesting memoir of the late Dr. G. D. Liveing, F.R.S., to the issue of *Nature* dated January 24.

THE DEATH IS ANNOUNCED at Yardley, Birmingham, of Mr. Samuel Thornley at the age of 85. He was head of the firm of Thornley and Knight, varnish manufacturers.

PROFESSOR ANDREAS VON ANTROPOFF, of the Technische Hochschule, Karlsruhe, has been offered the chair of physical chemistry at the Chemical Institute in the University of Bonn.

THE PRESENTATION OF THE PERKIN MEDAL to Mr. Hugh Kelsea Moore by the Society of Chemical Industry, American Section, was made at the Chemists' Club, New York, on January 16.

GRIESHEIM CHEMICAL WORKS, FRANKFURT, are to build ammonia and nitrate plants in Chicago and Baltimore, and several directors of the German company will visit America in the near future.

PROFESSOR BOHUSLAV BRAUNER, professor of chemistry at the Charles' (Bohemian) University at Prague, has been awarded the cross of a chevalier of the French Légion d'Honneur for his scientific work in chemistry.

A " SELF-CONTAINED " GAS MASK producing its own oxygen has been invented by Mr. H. C. Carter, an engineer, of Victoria. It has been subjected to severe tests, and is said to have great possibilities for use amongst miners, divers, and mountaineers.

ESCORTED TOURS TO THE LYONS FAIR to be held from March 2 to 15 have been arranged. Full particulars of these special facilities at an inclusive cost of £13 10s. can be obtained from the British Representative, Mr. J. A. Victor, 77a, Queen Victoria Street, London, E.C.4.

AN APPEAL FOR A PROTECTIVE TARIFF of 200 per cent. on German-made magnesium chloride has been made to the Indian Tariff Board by the Pioneer Magnesium Chloride Works of Kharagoda and Bombay. This is in order that Indian manufacturers of this product may compete on equal terms with European producers.

SODA PRICES IN RUSSIA have been fixed by agreement between the leading manufacturers. The prices agreed are: Caustic soda, 4·05 roubles per pood; soda ash, 1·55 roubles per pood, f.o.b. manufacturer's station. The price quoted on sulphuric acid is 87 kopeks per pood; hydrochloric acid, 1·95 roubles per pood, f.o.b. manufacturer's station. A pood is equal to 36·112 lb.

FREE LECTURES by members of the staff of Rothamsted Experimental Station, Harpenden, will be given to agricultural and other bodies interested in the researches carried on at Rothamsted. Among the subjects to be dealt with are—agricultural chemistry and botany, soil physics, insecticides, etc. All particulars of these special facilities may be obtained from the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

A PRESENTATION has been made by the United Alkali Co., Ltd., to Mr. John Farrant on his retirement from the position of chief cashier to the company. The presentation, which took the form of a silver tea and coffee service with salver, was made by the managing director, who referred to the fact that Mr. Farrant had served for over 56 years with the United Alkali Co., Ltd., and its predecessors, Gaskell, Deacon & Co. Mr. Farrant started as an office boy.

TESTS FOR DISCOVERING FLAWS in steel tyres were demonstrated on January 23 at the workshops of the London, Midland, and Scottish Company, at Horwich. From lumps of pig iron thrown into the smelting furnaces, to the finished tyres newly shrunk and bolted on wheels, the whole system of production was shown. Mr. George Hughes, chief mechanical and electrical engineer explained that it was seldom that a tyre from the works failed. The tyre involved in the recent Lytham disaster, which was discovered to have a flaw, was one of thirty-one produced from one casting of twenty tons of metal. The whole of the remaining thirty had been immediately called in and broken up. The metal was subjected to the severest tests, and in no instance was the slightest flaw discovered.

AN X-RAY SPECTRA APPARATUS for use in the Department of Physics has been received by Manchester University from the General Electric Co. of the U.S.A.

REPORTS FROM FREDERIKSTAD state that a factory for the production of oilcake will shortly be built near the site of Lever Brothers' new soap factory.

IMPORTS OF COAL TAR DYES for December, 1924, through the port of New York totalled 314,673 pounds, with an invoice value of $283,655. The values for November and October were $351,887 and $455,787 respectively.

SWEDEN'S STRONG PULP PRODUCTION is finding a ready market, about 60 per cent. of the year's output being already sold, principally to the United States. About a third of the year's sulphite production is also already sold.

CAMBRIDGE UNIVERSITY NEWS includes the appointment of Sir Joseph Broodbank as a member of the committee of management of the Low Temperature Station for Research in Biochemistry and Biophysics until December 31, 1928.

THE VISCO ENGINEERING CO., LTD., has removed to larger premises at 162, Grosvenor Road, London, S.W.1 The announcement is made on an illustrated leaflet showing a water cooler, an air filter, and a ventilating plant manufactured by the firm.

THE HEARING OF THE GAS MASK CLAIM by a Birmingham chemist (reported in THE CHEMICAL AGE last week) was reopened on Monday before the Royal Commission on Awards to Inventors. Further evidence was heard, and the decision of the Court will be announced in due course.

THE FORMATION OF TRUSTS in the fertiliser industry is objected to by Dr. R. Broersma, writing in the *Nieuw Rotterdamsche Courant*. As it is contracts are being made for several years, but there are signs that in a couple of years there will be a great chemical industry in the Dutch East Indies.

THE DEATH IS ANNOUNCED of Mr. H. Nickols, of Leeds. He was a prominent figure in the leather and tanning industries and a director of many companies, including Joseph Turner and Co., Ltd., chemical manufacturers. Mr. Nickols, who was a septuagenarian, had remarkable business abilities, and originated and controlled many large enterprises in the leather world.

THE DANGERS OF BORIC ACID as a food preservative were explained by Professor W. E. Dixon, speaking as a member of a deputation to the Minister of Health. He had reason to believe that boric acid often served to mask the effects of unsuitable methods of preparation and manufacture. Professor Dixon stated that if all the recommendations of the Committee on Food Preservatives were enforced it would not add anything to the cost of living.

ARISING FROM A STATEMENT last week that 12 cases of epitheliomatous ulceration were recorded during December, we have received from H. F. O'Brien and Co., Broadheath Oil Works, Altrincham, near Manchester, an interesting pamphlet on the subject. It gives the result of expert investigation into the relation between the use of mineral oils and this disease. It also gives full particulars of the firm's product, " Antican "—an oil claimed to be free from all ingredients connected with this " Spinners' Cancer."

MR. F. P. BAYLEY, of Bayley, Clanahan and Co., Manchester, has been elected a member of the Council of the British Chemical and Dyestuffs Traders' Association, Ltd. The latest bulletin of the Association warns members to be cautious of offers of acetic acid guaranteed to be made from acetate of lime, which is being offered chiefly from Holland. In practically every case, when the goods have arrived, and payment for same has been made, they have been found on analysis to be " synthetic," and the importer has had to pay duty for that reason.

AN INTERESTING SIDELIGHT on the development of the Italian chemical industry is revealed by the import figures published in the *Board of Trade Journal*. In 1913 imports from the United Kingdom of potash and caustic soda totalled 105,406 quintals, whereas the figures for the first nine months of 1924 show only 7,700 quintals. Even more marked is the decrease in imports of copper sulphate, the figures for these periods read—297,435 and 41,477 quintals. Corresponding figures for sulphate of ammonia are—90,281 quintals in 1913, and 37,680 for the first nine months of 1924.

A FIRE, thought to have been caused by spontaneous combustion in a waste box, did considerable damage to the chemical laboratory at Darlington Technical College on Saturday last.

FURTHER HEARINGS of the Nagadi Soda Company's scheme of arrangement have been taken in the Chancery Court this week. At the time of going to press the hearing was not completed.

THE COUNCIL OF MANCHESTER UNIVERSITY has accepted the resignation of Mr. H. Lowery, B.Sc., assistant lecturer in physics, on his appointment to a lectureship at Bradford Technical College.

OXFORD UNIVERSITY announces that Mr. J. T. Irving, B.A., of Caius College, has been elected into the Benn W. Levy Research Studentship, awarded for research in Bio-Chemistry. Its value is about £100 a year.

A TENNIS BALL FILLED WITH NITROGEN has been invented by Mr. A. E. Penfold, technical expert to the Dunlop Rubber Co. Certain chemicals are placed in the sphere of soft rubber and when heated result in the vulcanisation of the rubber and the production of the inflating gases.

THE HOME OFFICE has issued a notice to the effect that Subsection 4 of Section 73 of the Factory and Workshop Act, 1901, will apply to all cases of (i) poisoning by carbon bisulphide, (ii) aniline poisoning, and (iii) chronic benzene poisoning occurring in a factory or workshop. The Order will come into force on February 1.

THE BIRMINGHAM EDUCATION COMMITTEE announces that a sum of £50 has been received from Philip Harris and Co. (1913), Ltd., laboratory apparatus manufacturers, being the final instalment of a donation promised by the firm in 1921 towards the cost of equipping the new Chemical Research Laboratory at the Birmingham Municipal School.

MR. ALEXANDER JOHNSTONE, who presided at the annual luncheon of the Indiarubber Manufacturers' Association held at Manchester on Tuesday, said that the industry should be organised according to branches of trade rather than localities. A committee was now sitting to revise the organisation, in order to divide it into sections which should cover each branch of production separately. The work before the Association was to do away with suicidal competition.

MR. GEORGE E. LEARNARD, President of the International Combustion Engineering Corporation, and director of Vickers and International Combustion Engineering, Ltd., is in London in connection with big developments of the above companies, and Messrs. Vickers, Ltd., and associated concerns. Mr. Learnard states that the progress made in American power plant design, particularly in regard to pulverised fuel firing, has been phenomenal, contracts placed in 1924 being for equipment to serve boilers having over a million square feet of heating surface.

THE ANNOUNCEMENT IS MADE that active arrangements are in progress at Birmingham University towards the formation of a " sugar school " in connection with the Department of Brewing and the Bio-chemistry of Fermentation. The work of the Department is to a large extent cognate with the requirements of the sugar industry, and in recent years many original papers have been published by its members on the chemistry of sugars, as well as of starch and other allied substances. The new departure is said to involve training not only in academic chemistry and physics, but also in engineering. The Bio-chemistry Department will, it is hoped, before long, be removed to the New University Buildings at Edgbaston.

A CHARGE OF FRAUDULENT CONSPIRACY was preferred at the Manchester City Police Court on Monday against Frederick William Merryweather, company director, of Crumpsall, Manchester; Henry Powell Hudson, of Hazel Grove, Stockport; Dennis Gould, of Prestwich, Manchester; and Archibald Douglas Powell, of Patricroft, near Manchester. It was alleged against the accused that they had conspired together fraudulently to obtain ten hundredweights of permanganate of potash valued at £32 13s. 4d. from Johnson and Sons, manufacturing chemists. Merryweather was described as a director of F. W. Merryweather and Co., Ltd., Pritchard Street, Chorlton-on-Medlock, Manchester. An application for a remand was made by the police, who stated that it was possible that other charges would be preferred against the four men. It was stated on behalf of Merryweather that he had been a member of the Manchester Provision Exchange for twenty years, and as regards his integrity it was stated that he had invited the Official Receiver to investigate the affairs of the company of which he was a director. The accused was remanded for eight days, bail being allowed.

Mining Research at Birmingham

THE Executive Board of Mining Research associated with Birmingham University has issued a comprehensive report on the work carried out at the laboratory at Edgbaston from 1921 to 1924.

The researches carried out are roughly classified under three headings—(1) General researches on mining problems and the utilisation of fuel; (2) researches on the spontaneous combustion of coal; (3) researches conducted for the Deep and Hot Mines Committee. In connection with general research the problems investigated have related to the absorption of gases by coal, the Hamstead Colliery explosion of 1921, the resistance of breathing tubes, the hydrogenation and liquefaction of coal, and certain physiological experiments connected with carbon monoxide poisoning. The researches on the spontaneous combustion of coal have continued to form the chief section of the work of the laboratory in its application to underground problems. One of the points examined was the liability of fusain (mother of coal) to spontaneous combustion, and the conclusion reached was that from the chemical point of view fusain has little to do with the main production of heat during the initial stages of most cases of spontaneous combustion, although from a physical point of view bands of fusain (smut) might possibly be a primary source of trouble in that they supply the necessary channel for the air to reach the more readily oxidisable material.

The Dyeing of Artificial Silk

MR. SIDNEY A. WELCH, speaking at the Textile Institution, London, on January 22, said that it had been discovered that celanese was transparent to ultra-violet rays. Celanese was the only non-animal fibre which could be cross-dyed with both cotton and wool. In this connection the " Murochrome," a combined camera and projector, was mentioned. As the former, with a battery of lens, it was employed to photograph the pattern or design; as the latter each lens projected its own particular coloured element, and the elements meshed on the screen formed a picture in natural colours. The colours of any element projected could be changed at the will of the operator, and three-colour effects could be obtained on celanese, cotton and wool.

These three-colour schemes were now a practical commercial proposition. The colours discovered by Mr. Holland Ellis and used extensively for the dyeing of celanese had for the most part no affinity for cotton or wool, and were hence useful for cross-dyeing. Wool dyes could also be selected which did not affect celanese or cotton, and there only remained the probability of cotton dyes, which were resistant to both celanese and wool. A number of dyestuff makers had made a speciality of " celanese resist " cotton dyes, but the cotton dyes which were resistant to wool were less numerous. Investigations were proceeding, however, and the number of available dyes was being added to every day.

Brotherton and Co., Ltd., and Glasgow Corporation

ON Tuesday the Court of Session, Edinburgh, considered a reclaiming note from the judgment given in July last by Lord Blackburn in the action raised by Brotherton and Co., Ltd., against the Glasgow Corporation in reference to a contract of lease and agreement between the parties by which the pursuers acquired the right to certain chemical works, buildings and ground appertaining to Provan Gas Works and to the tar and ammoniacal liquor produced at the defenders' gasworks.

The case was first tried by Lord Blackburn, who found in favour of the defenders. His Lordship considered that the proper construction had all along been placed on the contract. It is this judgment that the pursuers are now appealing against and a long hearing is anticipated.

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Abstracts of Complete Specifications

226,686. Arsenic and Antimony Compounds, Manufacture of. O. Y. Imray, London. From Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-Main, Germany. Application date, January 16, 1924.

Water-soluble compounds of arsenic and antimony for therapeutic purposes are obtained by the action of ethylene oxide or a homologue or derivative on an arseno-benzene, a stibino-benzene, an arseno-stibino-benzene, an arsenic acid, a benzene arsenoxide, a benzene stibinoxide, or a benzene arsine containing at least one amino group, or a substitution product of these substances. The benzene arsenoxides, benzene stibinoxides and benzene arsines are converted into arseno- and stibino-benzenes respectively. It is also possible to introduce into the molecule of the arseno-benzenes, etc., a sugar of any kind, by simultaneously employing for the reaction epihydrin alcohol or the like, and one or more sugars. Examples are given of the treatment of 4:4'-dioxy-3:3'-diaminoarseno-benzene with epihydrin alcohol to obtain 4:4'-dioxy-3:3'-diamino arseno-benzene-di-dioxypropane, and a large number of similar reactions to obtain other products.

226,689. White Lead, Production of. S. G. S. Dicker, London. From L. A. Aars., Vinderen, near Christiania, Norway. Application date, January 22, 1924.

This process is an improvement in the production of white lead by precipitating basic lead acetate solutions with carbon dioxide. It is found that a considerably heavier product can be obtained by commencing the precipitation with a solution of lead acetate of about 32°–34° Bé., and continuing it only until the concentration reaches 17°–18° Bé. The density of the precipitated white lead can be further increased by effecting the precipitation at a temperature of 0° C. or below. It is found that the white lead thus obtained does not "dust," and absorbs at least 10 per cent. less oil than white lead prepared by other methods.

226,699. Cyanogen Compounds, Production of. F. von Bichowsky and J. Harthan, 1412, S. San Fernando Boulevard, Glendale, Los Angeles, Cal., U.S.A. Application date, February 13, 1924.

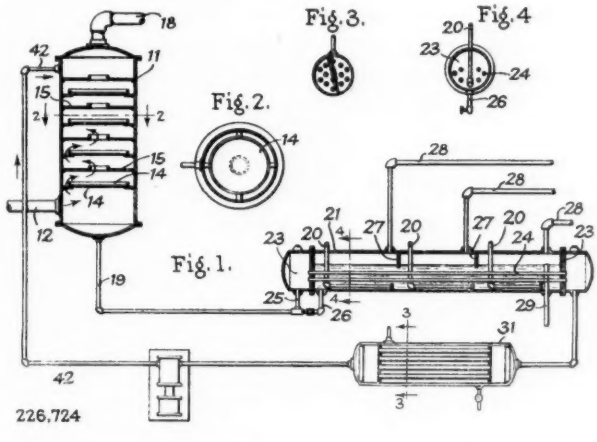
The process is for the preparation of hydrocyanic acid by the action of moist carbon dioxide on potassium or sodium cyanide. It is now found that if the reaction is carried out at a pressure less than atmospheric (50–710 mm. of mercury), and if the material is maintained moist, the reaction proceeds in steps, thus :—

$$NaCN + H_2O \rightleftarrows NaOH + HCN$$
$$(NaOH + HCN) + CO_2 \rightarrow NaHCO_3 + HCN$$

Very little polymerisation of the cyanogen compound takes place, and the yield of hydrocyanic acid is nearly theoretical. Further, the use of pressures less than atmospheric ensures that none of the poisonous hydrocyanic acid gas can leak out of the apparatus. The hydrocyanic acid can be separated from the carbon dioxide by adsorption in charcoal or silica gel, and pure hydrocyanic acid is thus obtained. The gas may be condensed, or may be absorbed in a solid alkali such as sodium carbonate or hydroxide. If this absorption is effected at a pressure of 50–710 mm. of mercury, it takes place readily and without any discolouration of the product ; the temperature of absorption should be about 500° C. The starting material may alternatively be an alkaline earth cyanide, or the products obtained according to Specification No. 190,390 (see The Chemical Age, Vol. VIII, p. 68). In an example, 125 grammes of commercial calcium cyanide is treated with 70 litres of moist carbon dioxide at a pressure of 250 mm. of mercury and a temperature of 20° C., the salt being kept moist. The hydrocyanic acid is adsorbed in activated charcoal, and subsequently recovered.

226,724. Fractionation of Oil Vapour. D. Pyzel, 3401, Broadway, Oakland, Alameda, Cal., U.S.A. Application date, April 22, 1924.

The object is to obtain from oil vapours a hydrocarbon of definite characteristics, or a definite range of boiling points. Vapour from an oil still passes through a pipe 12 to a dephlegmator 11 containing alternate annular plates and discs 15, 14, to provide a tortuous path for the vapour which finally passes out through a pipe 18 to other dephlegmators or condensers. Condensate from the still 21 is passed through a cooler 31 and delivered by a pump 41 through a pipe 42 to the top of the dephlegmator 11. The cold condensate condenses the vapour and also absorbs some of it, particularly in the cool upper part of the dephlegmator. The condensate passes through a pipe 19 to the still 21. This still is provided with horizontal tubes 24 secured in headers 23, and most of the hot condensate passes through the pipe 25 and tubes 24. A smaller portion of the condensate passes through a pipe 26 to the space surrounding the tubes 24, so that the latter are immersed in liquid. Partitions 27 extend downwards and dip



into the liquid, so that separate vapour spaces are formed from which vapour may be drawn off by pipes 28. Steam is injected by perforated pipes 20 and the level of the liquid is maintained by an overflow 29. The low boiling fractions are thus steam-distilled, the heat of evaporation being supplied by the hot oil in the tubes 24. The partly cooled oil then passes to the cooler 31 around which water is circulated. The condensate with a very definite range of boiling points is continuously delivered through the pipe 29, and some lower boiling constituents by the pipes 28.

226,731. Liquid Fuels, Manufacture and Production of. Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. International Convention date, January 14, 1924.

Fuel for internal combustion engines is improved by the addition of a small amount of carbonyl compound of iron. The addition may be made directly, or by producing the iron carbonyl simultaneously with the production of the fuel. This may be effected by bringing reaction gases containing carbon monoxide into contact with finely divided iron. The addition may be made to liquid fuels of various kinds, such as gasolene or alcohols. It is found that the addition of 0·1–1 per cent. of iron carbonyl to gasolene prevents "knocking" in internal combustion engines.

International Specifications not yet Accepted

225,187. Hafnium and Zirconium Compounds. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, 6, Emmasingel, Eindhoven, Holland. International Convention date, November 15, 1923.

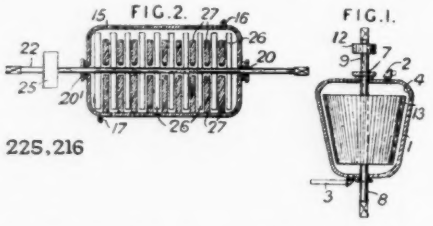
A hafnium ore is treated with carbon and chlorine and phosphoric acid added to obtain the mixed phosphates. These are treated with a liquid containing free hydrofluoric acid, such as a bifluoride solution, and the resulting solution poured into aqueous ammonia to precipitate the oxides. The double ammonium fluorides may be prepared from the oxides.

225,206. CYANAMIDE. Compagnie de l'Azote et des Fertilisants Soc. Anon., 8, Quai du Cheval Blanc, Geneva, Switzerland. International Convention date, November 20, 1923.

When calcium cyanamide is introduced into a solution of carbon dioxide to produce free cyanamide, the sulphuretted hydrogen content of the evolved gas suddenly increases and then decreases. At the maximum point there is no cyanamide remaining combined with calcium, and the introduction of fresh calcium cyanamide is delayed until this point has been reached.

225,216. ARTIFICIAL RESINS. Barrett Co., 40, Rector Street, New York. (Assignees of S. P. Miller and J. B. Hill, Philadelphia, Pa., U.S.A.) International Convention date, November 23, 1923.

Naphtha is emulsified or agitated with a polymerizing agent such as sulphuric acid to polymerize the coumarone and indene constituents. The products may be neutralised and

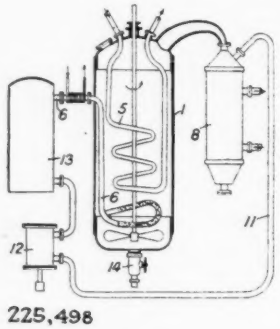


225,216

distilled in the usual manner. The mixture is agitated between a rotating conical member 13 and a conical casing 4. Inlet and outlet pipes 2, 3, are provided, and the member 13 is driven by the pulley 12. The peripheral speed may be 50–250 ft. per second, and the clearance may be 0·005–0·1 inch. In another emulsifier, a cylindrical casing 15 is provided with inlet and outlet 16, 17, and a rotating shaft 22 carries spokes 26 intermeshing with spokes 27 carried by the casing. The clearance is a few thousandths of an inch.

225,498. PURIFYING FATS AND OILS. L. Francesconi and M. Gaslini, 31, Via XX. Settembre, Genoa, Italy. International Convention date, November 26, 1923.

The oil or fat is treated with about 1½ times the quantity of glycerine necessary to esterify most of the fatty acids. The product is washed with water to remove the excess of glycerine.


225,498

In an example oil containing 20 per cent. of free acids is heated with active charcoal to 170° C. by a steam coil 5 in a vessel 1. Dry hot carbon dioxide is passed in by a pipe 6, and glycerine slowly added. The volatile impurities pass to a condenser 8, from which the carbon dioxide passes by a pipe 11 to a compressor 12 and reservoir 13 for use again. The oil is drawn off by a valve 14.

225,499. DETINNING TIN-PLATE. Q. Marino, 13, Rue du Plan, Incliné, Liege, Belgium. International Convention date, November 28, 1923.

Tin-plate is treated with hydrochloric acid containing a substance which will generate nascent chlorine, such as alkali chromates, dichromates, manganates, permanganates, manganic salts, or manganese dioxide, at a temperature of 70°–90° C. The tin is dissolved, and may be recovered by displacing with zinc or by electrolysing with an anode of carbon and a cathode of copper or iron.

225,509. CARBONISING PROCESSES. Kohlenscheidungs-Ges., 100, Friedrichstrasse, Berlin. International Convention date, November 28, 1923.

Gas obtained by low-temperature carbonisation is passed through a chamber which receives the coke or semi-coke and which is heated to about 700° C. The proportion of light oils is increased.

225,513. LOW-TEMPERATURE CARBONISATION. Kohlenscheidungs-Ges., 100, Friedrichstrasse, Berlin. International Convention date, November 28, 1923.

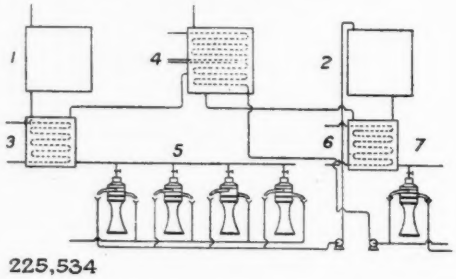
The fuel is supplied to a horizontal retort containing a conveyor screw, and which is heated at one end to 700° C. The screw at this end has a quick pitch so that the material is quickly moved through the hot zone, and then more slowly through the zone of a normal distilling temperature. The distillates are drawn off from the hot zone.

225,523. LITHOPONE. Farbenfabriken vorm. F. Bayer and Co., Leverkusen, near Cologne, Germany. International Convention date, November 30, 1923.

Lithopone is rendered fast to light by adding 0·02–0·5 per cent. of a heavy metal compound, such as a salt or double salt of iron, cobalt, nickel, or copper. This compound may be added to the precipitated or dried lithopone before or after ignition, or the zinc salt employed in the manufacture may have the necessary amount of the metallic compound left in it during purification, or added after purification.

225,534-5. EXTRACTING PARAFFIN WAX. Aktiebolaget Separator-Nobel, 8, Fleminggatan, Stockholm. International Convention date, November 28, 1923.

225,534.—Waxes are separated from crude oils by diluting with gasolene, naphtha, or other liquid of low density, and cooling and filtering, or otherwise separating. In this invention, the crude oil is first cooled to precipitate the wax and the cooled diluent then added. A fractional separation of the wax may be obtained by conducting these operations in stages. The diluent may be such as to transform the precipitated wax from its semi-colloidal state.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The oil is cooled in a crystalliser 1 and passes to a mixer 3, where gasolene is added from a continuous cooler 4. The precipitated wax is separated in a series of centrifuges 5, and the liquid is again cooled in a vessel 2, passes to a vessel 6, where it is mixed with more gasolene, and then passes through other centrifuges 7. The cold liquid may be used for cooling the vessels 1, 2 and 4.

225,535.—In the separation of waxes as in 225,534 above, the hydrocarbon liquid is first cooled to −15° C., and centrifuged alone or with sufficient addition of gasolene to separate some of the waxes. The remaining waxes are then separated by adding gasolene.

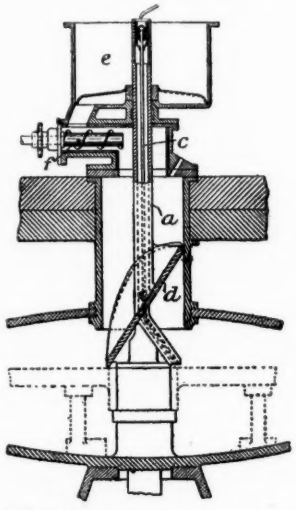
225,544. DYES AND INTERMEDIATE PRODUCTS. Soc. of Chemical Industry in Basle, Switzerland. International Convention date, November 30, 1923. Addition to 210,413. (See THE CHEMICAL AGE, Vol. X, p. 363.)

2-chloranthraquinone 3-carboxylic acid is condensed with glycine in the presence of magnesia and copper powder to obtain anthraquinone-2-glycine-3-carboxylic acid. This acid is treated with a condensing agent such as acetic anhydride and sodium acetate, to obtain anthraquinone-2 : 3-indoxyl, or the di-acetyl derivative. To convert the latter into a dyestuff, it may be treated with concentrated sulphuric acid, or with alkali in the presence of air, or by condensation with a

cyclic-*o*-di-ketone or a chloride or anil thereof, *e.g.*, an isatin, thioisatin, or acenaphthenequinone. These dyestuffs may also be halogenated. Several examples of the dyestuffs are given, employing the various reagents indicated, for the production of dyestuffs which dye cotton red-blue to blue-black, or green tints.

225,545 and 225,548. CHEMICAL FURNACES. Farbwerke vorm. Meister, Lucius and Brüning, Hoechst-on-Main, Germany. International Convention date, November 26, 1923.

225,545.—A salt cake furnace is fed from a hopper *e* by a screw conveyor *f* and falls on to a distributor in the form of a



225,545

shovel *d* which is fixed to the stirrer shaft *a*. The acid delivery pipe *c* passes upwards through the stirrer shaft.

225,548.—In a mechanical furnace for making salt cake the muffle is made of brick or stone instead of cast iron. The furnace is heated by producer and water gas and the air is heated and steam generated for the water gas plant by waste heat.

225,546. CRACKING TAR. H. Suida, 12, Hamerlinggasse, Mödling, Austria. International Convention date, November 30, 1923.

Crude tar obtained from lignite is destructively distilled with steam in a long tube at 800°–900° C. The products include a gas containing 30–35 per cent. of olefins and an oily residue.

225,552. DISTILLING GLYCERINE, FATTY ACIDS, ETC. Metallbank und Metallurgische Ges., Akt.-Ges., 45, Bockenheimer, Anlage, Frankfurt-on-Main, and W. Gensecke, 87, Homburgerstrasse, Bad Homburg, Germany. International Convention date, November 28, 1923.

Glycerine, fatty acids, etc., are distilled by means of steam, and the vapour is passed through a water-cooled condenser which condenses the glycerine and fatty acids, but not the steam. The vapour is then compressed by a steam jet injector into a jet condenser leading through a liquid separator to a vacuum pump. A higher degree of vacuum is thus obtained.

LATEST NOTIFICATIONS.

227,837. Processes of making cement and by-products. Eckel, E. C. January 14, 1924.

227,839. Manufacture of chemically-pure sulphuric acid. Soc. Anon. de Produits Chimiques de Droogenbosch. January 19, 1924.

Specifications Accepted with Date of Application

209,150. Naphthoquinone, Manufacture of derivatives of. Soc. Anon. des Matieres Colorantes et Produits Chimiques de Saint Denis, A. R. Wahl and R. Lantz. October 28, 1922. Addition to 191,064.

208,143. Albumen products or compounds containing arsenic, Production of. Haco-Ges. Akt.-Ges., Bern. December 9, 1922.

210,432. Alcohol, Process for dehydrating. P. Verola, C. Baron, A. Verley and E. Urbain. January 23, 1923.

212,883. Furnace for chemical reactions. Naamlooze Vennootschap Stikstofbindings-Industrie "Nederland." March 13, 1923.

214,581. Absolute alcohol, Apparatus for the continuous manufacture of. Ricard, Allenet et Cie. April 16, 1923.

215,021. Halogenated oxythionaphthenes, Manufacture of. Farbwerke vorm. Meister, Lucius and Brüning. April 28, 1923.

215,379. Diazo dyestuffs, Manufacture of. Durand and Huguenin Akt.-Ges. May 2, 1923.

218,316. Tanning materials, Manufacture of. Akt.-Ges. für Anilin Fabrikation. June 29, 1923.

226,475. Vulcanised rubber, Manufacture of oil from. A. Bray. December 18, 1923.

227,143. Filtration of solutions and the like. C. Weizmann and J. Blumenfeld. August 3, 1923.

227,147. Oxygenated organic compounds, Manufacture and production of. J. Y. Johnson. (*Badische Anilin and Soda Fabrik.*) August 28, 1923.

227,177. Oils, Production of materials for purifying. P. W. Prutzman and C. J. von Bibra. October 8, 1923.

227,196. Gas streams, Apparatus for the extraction of particles from. M. W. Carty. October 11, 1923.

227,212. Oxidation of oils. H. Schofield. October 16, 1923.

227,217. Manures, Manufacture of. F. L. Schmidt and A. Messer-Schmitt. October 18, 1923.

227,232. Esters, Manufacture of. F. Hefti and W. Schilt. October 31, 1923.

227,262. Muffle and the like furnaces. H. F. Coggon and August's Muffle Furnaces, Ltd. December 6, 1923.

227,268. Minerals, Machine for classifying. W. R. Sawyer. December 17, 1923.

227,270. Refractory materials. Morgan Crucible Co., Ltd., and P. Lindsay. December 17, 1923.

227,301. Roasted zinciferous ores or metallurgical products, Extraction of. A. Nathansohn and F. Leyser. February 18, 1924.

227,309. Gas from a mixture of gases, Process of and apparatus for separating. H. Wade. (*Silica Gel Corporation.*) March 11, 1924.

227,319. Iron oxide pigments, Electrolytic process for preparing. H. G. C. Fairweather. (*Magnetic Pigment Co.*) March 31, 1924.

227,134. Cellulose acetates, Manufacture of. J. O. Zdanowich. July 4, 1923.

217,168. Cellulose conversion products, Production of. L. Lilienfeld. June 6, 1923.

220,302. Intermediate products, Manufacture of. Society of Chemical Industry in Basle. August 9, 1923.

Applications for Patents

Bockmühl, M., Farbwerke vorm. Meister, Lucius and Brüning and Schwarz, A. Manufacture of N-methylsulphites of secondary aromatic-aliphatic amines. 2,218. January 24.

Bollmann, H. Method of deodorising fats, etc. 2,143. January 24. (Germany, September 3, 1924.)

British Dyestuffs Corporation, Ltd., and Horsfall, R. S. Protecting animal fibre when treating with acids and alkalis. 2,008. January 22.

Burt, Boulton and Haywood, Ltd., and China, F. J. E. Producing minute disintegration of substances suspended in liquids. 1,880. January 21.

Chemische Fabrik Griesheim-Elektron and Schwalbe, C. G. Bleaching vegetable fibres. 1,956. January 22.

Dicker, S. G. S., Harter, H., and Otto, A. T. Catalytic synthesis of ammonia. 1,899. January 21.

Farbwerke vorm. Meister, Lucius and Brüning and Imray, O. Y. Manufacture of azo-dyestuffs. 2,217. January 24.

Holliday and Co., Ltd., L. B. Application of dyestuffs to cellulose acetate, etc. 2,161. January 24.

Hyde, A. C. Manufacture of superphosphates. 1,596. January 19.

Norsk Hydro-Elektrisk Kvælstofaktieselskab. Production of solidified cyanides of alkali metals. 1,907. January 21. (Norway, March 8, 1924.)

Norsk Hydro-Elektrisk Kvælstofaktieselskab. Production of ammonia. 1,908. January 21. (Norway, March 21, 1924.)

Shaw, H. S. Hele-. Filters. 1,856. January 21.

Soc. Chimique des Usines du Rhône. Manufacture of cellulose esters, etc. 2,220. January 24. (France, April 2, 1924.)

Verein für Chemische und Metallurgische Produktion. Manufacture of barium chloride and production of alkali hydro-shulphide. 1,748. January 20. (Czecho-Slovakia, January 21, 1924.)

Victor Chemical Works. Phosphoric acid. 2,118. January 23. (United States, January 23, 1924.)

Werner, K. Magnesia cement. 2,201. January 24.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, January 29, 1925.

THE general demand for chemicals has decidedly improved during the last week and the expansion in consumptive demand is slow but sure. Prices are remarkably steady and changes on the whole are in an upward direction.

Export inquiry is fairly good, but as we mentioned last week, the overseas limits are generally too low to bring about immediate results.

General Chemicals

ACETONE is lower in price at £81 per ton ex wharf.

ACID ACETIC.—The demand has improved considerably and a fair business is passing. Price is £41 per ton technical and £42 per ton 80 % pure.

ACID CITRIC is very firm, makers' prices have advanced and an improvement in the spot price should not be long delayed.

ACID FORMIC is in good demand, price unchanged at £53 per ton.

ACID LACTIC is a fair market at £43 per ton for 50 % by weight.

ACID OXALIC is in fairly active demand, price is about 3¾d. per lb. and tending upwards.

ACID TARTARIC.—The general outlook has improved and as the season advances higher prices are looked for.

ALUMINA SULPHATE.—Unchanged.

ARSENIC is a dead market with a tendency in buyers' favour. Reliable foreign makers are quoting at £30 per ton, and something lower might be expected with firm business in hand.

BARIUM CHLORIDE is a fair market, price unchanged at £12 per ton.

COPPER SULPHATE.—A steady business is passing at about £23 per ton.

CREAM OF TARTAR is a little lower in price at about £76 to £77 per ton. Raw materials are remarkably firm and the decline is entirely due to depreciation in exchange.

EPSOM SALTS.—Unchanged.

FORMALDEHYDE is lower in price at about £44 per ton.

LEAD ACETATE is a firm market, although not quite so active as recently. White is quoted £48 per ton and brown £45 per ton to £46 per ton.

LEAD NITRATE is unchanged.

LIME ACETATE is a steady market at about £14 per ton for grey 80%.

CARBONATE AND CAUSTIC POTASH are unchanged.

POTASH PERMANGANATE is rather firmer at about 8¼d. to 8¾d. per lb.

POTASH PRUSSIATE is a strong market, quotation is nominally 8d. per lb., but may go higher.

SODA ACETATE is in poor demand at about £23 per ton.

SODA BICHROMATE is unchanged.

SODIUM HYPOSULPHITE is unchanged.

SODIUM PRUSSIATE is much firmer and the makers are well sold. The price of 4½d. is hardly likely to rule for very long.

SODIUM SULPHIDE remains uninteresting.

Coal Tar Products

There is no very marked change in the market for coal tar products since last week.

90% BENZOL is firmer at 1s. 9d. to 1s. 9½d. per gallon on rails.

PURE BENZOL is still quoted at 2s. per gallon on rails.

CREOSOTE is very scarce and is quoted at 6½d. per gallon on rails in the North, and in London at 7¼d. to 7½d. per gallon.

CRESYLIC ACID remains very quiet and is worth 1s. 10d. per gallon on rails in bulk for the pale 97/99% quality, while the dark quality 95/97% is worth 1s. 7d. per gallon on rails.

SOLVENT NAPHTHA is steady at 1s. 4d. per gallon on rails.

HEAVY NAPHTHA is quoted at 1s. 2d. per gallon on rails.

NAPHTHALENES are very dull, the prices remaining the same as last week; 76/78 quality is quoted at £6 to £6 10s. per ton, 74/76 at £5 10s. to £6 per ton, and the lower grade drained qualities at £4 10s. to £5 per ton.

PITCH.—The demand remains poor and prices show further signs of weakness. To-day's values are 47s. 6d. to 50s. f.o.b. London; 45s. to 47s. 6d. f.o.b. East and West Coast ports.

Nitrogen Products Markets

Export.—During the month of January the demand for export has steadily continued, and is absorbing the quantities which the producers have available for shipment at about £13 15s. per ton f.o.b. As the season advances, it is expected that the smaller quantities available for export may cause the price to be raised to £14 or perhaps even to £14 5s. per ton f.o.b. The statistical position of the British producers is now so strong that it is perfectly certain that very little stock will be carried into the new fertiliser year.

In all consuming countries, the year 1924–25 has shown a marked increase in popularity of sulphate of ammonia and the consumption has been increased by 10–20 per cent. As a consequence the huge increased German production has been placed without any undue pressure on prices. The sag in American production over the autumn months gave the impression in the market that the United States would be importers on a large scale, but the total sales to that country do not amount to more than 15,000 tons, all supplied by continental producers, and it is expected that for the remainder of the season the American demand can be supplied from within.

Home.—Prices for the remainder of the season have been previously announced. You will have observed that they are considerably lower than last year's prices. The consumer has shown appreciation of the difference, and up to the present home sales are about 10,000 tons in advance of those up to the same date last year. Indications from various parts of the country point to a further increase of 5,000–10,000 tons before the season ends. The regular seasonal rush of home orders has just commenced. The chief feature in the orders received so far is the distinct preference of the consumer for neutral quality.

Nitrate of Soda.—For the last month the Nitrate of Soda market has remained quiet. The Producers' Association has reported small sales for prompt delivery at about £11 15s. per ton and for forward delivery at about £12 per ton. The last two months have shown a distinct falling off in the number of sales, and many think that the scale of prices of the Producers' Association commenced at too high a figure.

It is almost certain that they will carry out this scale, although the consequence will probably be the carrying over of large stocks into the new year. The American demand for nitrate has been quite up to the Producers' estimates, but European consumption lags behind. The last report from America shows that the spot price was affected adversely by the expected diversion of shipments intended for Europe to that country.

X-rays and Steel Castings

IN his second lecture on Radiological Research at the Royal Society of Arts on Monday, Mr. V. E. Pullin, Director of the Radiological Research Department, Woolwich, indicated the lines of modern radiological research in relation to industry. He said that what was wanted was that radiology should be an indispensable adjunct of all modern engineering practice. By means of X-rays it was possible to detect flaws in steel castings before money was spent upon machining them and preparing them for their final use. At present X-rays only enabled such castings when they were comparatively small to be examined. What was needed was apparatus which permitted the examination of castings of eight, ten, or twelve inches in thickness.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at retailers' works.

General Heavy Chemicals

Acid Acetic, 40% Tech.—£22 to £24 per ton.
Acid Boric, Commercial.—Crystal, £45 per ton, Powder, £47 per ton.
Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d., according to purity, strength and locality.
Acid Nitric, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.
Acid Sulphuric.—Average National prices f.o r. makers' works. with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 65s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.
Bleaching Powder.—Spot, £10 10s. d/d.; Contract, £10 d/d. 4 ton lots.
Bisulphite of Lime.—£7 10s. per ton, packages extra.
Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)
Calcium Chloride (Solid).—£5 12s. 6d. to £5 17s. 6d. per ton d/d, carriage paid.
Copper Sulphate.—£25 to £25 10s. per ton.
Methylated Spirit 64 O.P.—Industrial, 2s. 7d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.
Nickel Sulphate.—£38 per ton d/d. Normal business.
Nickel Ammonia Sulphate.—£38 per ton d/d. Normal business.
Potash Caustic.—£30 to £33 per ton.
Potassium Bichromate.—5½d. per lb.
Potassium Chlorate.—3d. to 4d. per lb.
Salammoniac.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton. Carr. pd.
Salt Cake.—£3 10s. per ton d/d. In bulk.
Soda Caustic, Solid.—Spot lots delivered, £15 12s. 6d. to £18 per ton, according to strength; 20s. less for contracts.
Soda Crystals.—£5 to £5 5s. per ton ex railway depots or ports.
Sodium Acetate 97/98%.—£24 per ton.
Sodium Bicarbonate.—£10 10s. per ton, carr. paid.
Sodium Bichromate.—4½d. per lb.
Sodium Bisulphite Powder 60/62%.—£17 to £18 per ton, according to quantity, f.o.b., 1-cwt. iron drums included.
Sodium Chlorate.—2½d. to 3½d. per lb.
Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool. Nominal.
Sodium Nitrite 100% basis.—£27 per ton d/d.
Sodium Sulphide conc. solid. 60/65.—About £15 per ton d/d. Contract £14 15s. Carr. pd.
Sodium Sulphide Crystals.—£9 5s. per ton d/d. Contract £9 2s. 6d. Carr. pd.
Sodium Sulphide, Pea Crystals.—£15 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—5½d. per lb. Slightly better demand. Crude 60's, 1s. 8d. to 1s. 9d. per gall. Market firmer.
Acid Cresylic 97/99.—1s. 11d. to 2s. 1d. per gall. Pale, 95%, 1s. 8d. to 1s. 11d. per gall. Dark, 1s. 7d. to 1s. 11d. per gall. Steady demand.
Anthracene Paste 40%.—4d. per unit per cwt.—Nominal price. No business.
Anthracene Oil, Strained.—7d. to 8d. per gall. Unstrained, 6d. to 7d. per gall.
Benzol.—Crude 65's.—9d. to 11½d. per gall., ex works in tank wagons. Standard Motor, 1s. 4½d. to 1s. 6d. per gall., ex works in tank wagons. Pure, 1s. 9½d. to 1s. 11d. per gall., ex works in tank wagons. Supplies very scarce.
Toluol,—90%, 1s. 7d. to 1s. 7½d. per gall. More inquiry. Pure, 1s. 11d. to 2s. per gall. Steady demand.
Xylol Commercial.—2s. 3d. per gall. Pure, 3s. 3d. per gall.
Creosote.—Cresylic, 20/24%, 8½d. to 9d. per gall. Better demand. Middle Oil, Heavy, Standard specification, 6d. to 7d. per gall., according to quality and district. Market firmer. Steady demand.
Naphtha.—Crude, 8d. to 9d. per gall. Solvent 90/160, 1s. 3d. to 1s. 7d. per gall. Demand good. Solvent 90/190, 11½d. to 1s. 1d. per gall. Steady business.
Naphthalene Crude.—Demand rather better. Cheaper in Yorkshire than in Lancashire. Drained Creosote Salts, £3 to £5 per ton. Demand rather better. Whizzed or hot pressed, £6 to £9 per ton.
Naphthalene.—Crystals and Flaked, £12 to £15 per ton, according to districts.
Pitch.—Medium soft, 45s. to 50s. per ton, according to district. Not much business. Demand anticipated.
Pyridine.—90/160, 18s. to 18s. 6d. per gall. Fair inquiries. Heavy, 11s. to 12s. Rather flat.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.
Acid H.—3s. 10d. per lb. 100% basis d/d.
Acid Naphthionic.—2s. 2d. per lb. 100% basis d/d.
Acid Neville and Winther.—5s. 8d. per lb. 100% basis d/d.
Acid Salicylic, technical.—1s. 0½d. to 1s. 1d. per lb. Good demand.
Acid Sulphanilic.—9d. per lb. 100% basis d/d.
Aluminium Chloride, anhydrous.—10d. per lb. d/d.
Aniline Oil.—8d. per lb. naked at works.
Aniline Salts.—8d. per lb. naked at works
Antimony Pentachloride.—1s. per lb. d/d.
Benzidine Base.—3s. 9d. per lb. 100% basis d/d.
Benzyl Chloride 95%.—1s. 1d. per lb.
p-Chlorphenol.—4s. 3d. per lb. d/d.
p-Chloraniline.—3s. per lb. 100% basis.
o-Cresol 29/31° C.—3½d. to 4d. per lb. Poor demand.
m-Cresol 98/100%.—2s. 1d. to 2s. 3d. per lb. Demand moderate.
p-Cresol 32/34° C.—2s. 1d. to 2s. 3d. per lb. Demand moderate.
Dichloraniline.—2s. 3d. per lb.
Dichloraniline S. Acid.—2s. 3d. per lb. 100% basis.
p-Dichlorbenzol.—£85 per ton.
Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable.
Dimethylaniline.—2s. 2½d. per lb. d/d. Drums extra.
Dinitrobenzene.—9d. per lb. naked at works.
Dinitrochlorbenzol.—£84 10s. per ton d/d.
Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 1s. 2d. per lb. naked at works.
Diphenylaniline.—2s. 10d. per lb. d/d.
G. Salt.—2s. 2d. per lb. 100% basis d/d.
Monochlorbenzol.—£63 per ton.
a-Naphthol.—2s. 4d. per lb. d/d.
B-Naphthol.—1s. per lb. d/d.
a-Naphthylamine.—1s. 3½d. per lb. d/d.
B-Naphthylamine.—4s. per lb. d/d.
m-Nitraniline.—4s. 2½d. per lb. d/d.
p-Nitraniline.—2s. 2½d. per lb. d/d.
Nitrobenzene.—5¼d. to 5½d. per lb. naked at works.
o-Nitrochlorbenzol.—2s. 3d. per lb. 100% basis d/d.
Nitronapthalene.—10d. per lb. d/d.
p-Nitrophenol.—1s. 9d. per lb. 100% basis d/d.
p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.
m-Phenylene Diamine.—4s. per lb. d/d.
p-Phenylene Diamine.—10s. per lb. 100% basis d/d.
R. Salt.—2s. 4d. per lb. 100% basis d/d.
Sodium Naphthionate.—2s. 2d. per lb. 100% basis d/d.
o-Toluidine.—10d. per lb.
p-Toluidine.—2s. 4d. per lb. naked at works.
m-Toluylene Diamine.—4s. per lb. d/d.

Wood Distillation Products

Market quiet, American competition still fairly keen.
Acetate of Lime.—Brown £11 to £11 5s. per ton d/d and upward. Quiet market. Grey, £15 to £15 10s. per ton. Firmer. Liquor, 9d. per gall. 32° Tw.
Charcoal.—£7 5s. to £9 per ton, according to grade and locality. Fair demand.
Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.
Red Liquor.—10d. to 1s. per gall. 14/15° Tw.
Wood Creosote.—2s. 9d. per gall. Unrefined.
Wood Naphtha, Miscible.—4s. 9d. per gall. 60% O.P. Solvent, 5s. per gall. 40% O.P.
Wood Tar.—£3 5s. to £4 per ton. Demand slack and stocks being held.
Brown Sugar of Lead.—£44 per ton. Steady market.

Rubber Chemicals

Antimony Sulphide.—Golden, 5½d. to 1s. 4d. per lb., according to quality. Crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.
Arsenic Sulphide, Yellow.—1s. 11d. per lb.
Barytes.—£3 10s. to £6 15s. per ton, according to quality.
Cadmium Sulphide.—3s. 9d. to 4s. 3d. per lb., according to quantity.
Carbon Bisulphide.—£30 to £33 per ton, according to quantity.
Carbon Black.—6d. to 6½d. per lb., ex wharf.
Carbon Tetrachloride.—£62 10s. to £67 10s. per ton, according to quantity drums extra.
Chromium Oxide, Green.—1s. 3d. per lb.
Indiarubber Substitutes, White and Dark.—5d. to 9½d. per lb. Demand very brisk. Prices likely to remain steady owing to firmness of rapeseed oils.
Lamp Black.—£48 per ton, barrels free.
Lead Hyposulphite.—7½d. per lb.
Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£16 5s. per ton f.o.r. London.
Sulphur.—£10 to £12 per ton, according to quality.
Sulphur Chloride.—4d. per lb., carboys extra.
Sulphur Precip. B.P.—£56 to £65 per ton.
Thiocarbanilide.—2s. 6d. per lb.
Vermilion, Pale or Deep.—5s 6d. per lb. Dearer.
Zinc Sulphide.—7½d. to 1s. 8d. per lb., according to quality.

Pharmaceutical and Photographic Chemicals

Acid, Acetic 80% B.P.—£45 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—2s. 11d. to 3s. 1d. per lb., according to quantity. Sales steady. Price firm.
Acid, Benzoic B.P.—2s. 6d. per lb.
Acid, Boric B.P.—Crystal £51 per ton, Powder £55 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 4½d. to 1s. 5d. per lb., less 5% for ton lots. Increased demand.
Acid, Gallic.—2s. 9d. per lb. for pure crystal, in cwt. lots. Easier.
Acid, Pyrogallic, Crystals.—6s. per lb. for 1 cwt. lots. 7s. 6d. per lb. for 7-lb. lots according to quantity. Steady market.
Acid, Salicylic.—1s. 5d. to 1s. 6d. per lb., according to quantity. Steady market.
Acid, Tannic B.P.—2s. 9d. per lb. Quiet steady demand.
Acid, Tartaric.—1s. 1d. per lb., less 5%. Very firm. Demand good.
Amidol.—9s. per lb., d/d.
Acetanilide.—1s. 10d. to 2s. per lb. More inquiry.
Amidopyrin.—14s. 6d. per lb.
Ammonium Benzoate.—3s. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton.
Atropine Sulphate.—12s. 6d. per oz. for English make.
Barbitone.—13s. 9d. per lb.
Benzonaphthol.—5s. 3d. per lb. spot.
Bismuth Salts.—Prices reduced by about 1s. 3d. to 2s. 3d. per lb. on account of the fall in the price of the metal.
Bismuth Carbonate.—7s. 8d. to 9s. 8d. per lb. | Prices unsettled owing to difficulties in regard to supplies of the metal.
Bismuth Citrate.—8s. to 10s. per lb.
Bismuth Salicylate.—7s. 5d. to 9s. 5d. per lb.
Bismuth Subnitrate.—6s. 10d. to 8s. 10d. per lb.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 8d. per lb., easier; sodium, 1s. 9d. per lb., easier; ammonium, 2s. 1d. per lb. Market less firm.
Calcium Lactate.—1s. 7d. to 2s., according to quantity. Fair demand and steady market.
Chloral Hydrate.—4s. per lb.
Chloroform.—2s. 6d. per lb. for cwt. lots.
Creosote Carbonate.—6s. 6d. per lb. Little demand.
Formaldehyde.—£44 per ton, in barrels ex wharf London.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 50%, 2s. 6d. per lb.
Guaiacol Carbonate.—9s. 3d. per lb. Firmer.
Hexamine.—2s. 10½ per lb. For bold crystal. Powder slightly less.
Homatropine Hydrobromide.—25s. to 30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s per oz.
Hydroquinone.—4s. 3d. per lb. in cwt. lots. Foreign make.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—1s. 11d. to 2s. 3d. per lb.
Magnesium Carbonate.—Light Commercial, £36 per ton net. Light pure, £46 per ton.
Magnesium Oxide.—Light Commercial, £75 per ton, less 2½%; Heavy Commercial, £25 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d. per lb., according to quantity. Steady market.
Menthol.—A.B.R. recrystallised B.P., 50s. per lb., February delivery; Synthetic, 26s. to 35s. per lb. according to quality. English make. Increasing demand.
Mercurials.—Market very quiet. Red oxide, 5s. 2d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 7d. to 3s. 9d. per lb.; white precipitate, 4s. 6d. to 4s. 8d. per lb.; Calomel, 3s. 10d. to 4s. per lb.
Methyl Salicylate.—1s. 9d. to 1s. 11d. per lb.
Methyl Sulphonel.—21s. per lb.
Metol.—11s. per lb. British make.
Morphine and Salts.—Reduced by 1s. to 1s. 3d. per oz.
Paraformaldehyde.—2s. 8d. for B.P. quality.
Paraldehyde.—1s. 4d. to 1s. 6d. per lb., in free bottles and cases.
Phenacetin.—5s. 3d. per lb. in cwt. lots.
Phenazone.—6s. 8d. per lb.
Phenolphthalein.—5s. per lb. for cwt. lots.
Potassium Bitartrate 99/100% (Cream of Tartar).—86s. per cwt., less 2½% for ton lots. Raw material again dearer.
Potassium Citrate.—1s. 10d. to 2s. 2d. per lb.
Potassium Ferricyanide.—1s. 9d. per lb. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity Steady market.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7½d. per lb., carriage paid; commercial, 8d. to 8½d. per lb., carriage paid. Forward prices higher.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Steady market.
Resorcin.—5s. per lb. In fair quantities. Supplies exceed demand.
Saccharin.—63s. per lb. in 50-lb. lots.
Salol.—3s. 6d. per lb., for cwt. lots. Slightly dearer.
Silver Proteinate.—9s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—1s. 10d. to 2s. per lb. From natural benzoic acid. Supplies of good quality available.
Sodium Citrate, B.P.C., 1923.—1s. 11d. to 2s. 2d. per lb., according to quantity.
Sodium Hypophosphite, Photographic.—£13 to £15 per ton, according to quantity, d/d consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb.
Sodium Potassium Tartrate (Rochelle Salt).—75s. per cwt., for ton lots and upwards.
Sodium Salicylate. Powder, 2s. 2d. to 2s. 3d. per lb. Crystal, 2s. 3d. to 2s. 5d. per lb. Flake, 2s. 6d. per lb. Strong demand, market firmer.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb.
Sodium Sulphite, anhydrous, £27 10s. per ton, minimum 5 ton lots, according to quantity; 1 cwt. kegs included.
Sulphonal.—14s. 6d. per lb. Little demand.
Thymol.—18s. per lb. Firmer.

Perfumery Chemicals

Acetophenone.—11s. per lb.
Aubepine.—12s. 6d. per lb.
Amyl Acetate.—3s. per lb.
Amyl Butyrate.—6s. 6d. per lb.
Amyl Salicylate.—3s. 3d. per lb.
Anethol (M.P. 21/22° C.).—4s. 6d. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 9d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 9d. per lb.
Benzaldehyde free from Chlorine.—2s. 9d. per lb.
Benzyl Benzoate.—3s. 6d. per lb.
Cinnamic Aldehyde Natural.—18s. 6d. per lb.
Coumarin.—17s. per lb.
Citronellol.—20s. per lb.
Citral.—10s. per lb. Dearer.
Ethyl Cinnamate.—12s. 6d. per lb.
Ethyl Phthalate.—3s. per lb.
Eugenol.—10s. 6d. per lb.
Geraniol. (Palmarosa).—31s. 6d. per lb.
Geraniol.—12s. 6d. to 20s. per lb.
Heliotropine.—6s. 9d. per lb.
Iso Eugenol.—16s. per lb.
Linalol ex Bois de Rose.—26s. per lb.
Linalyl Acetate.—26s. per lb.
Methyl Anthranilate.—10s. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ambrette.—50s. per lb.
Musk Ketone.—42s. 6d. per lb.
Musk Xylol.—13s. 3d. per lb. Cheaper.
Nerolin.—4s. 6d. per lb.
Phenyl Ethyl Acetate.—15s. 6d. per lb.
Phenyl Ethyl Alcohol.—14s. 3d. per lb. Cheaper.
Rhodinol.—50s. per lb.
Safrol.—1s. 10d. per lb.
Terpineol.—2s. 4d. per lb.
Vanillin.—25s. to 25s. 6d. per lb.

Essential Oils

Almond Oil, Foreign S.P.A.—15s. 6d. per lb.
Anise Oil.—2s. 8d. per lb. Cheaper.
Bergamot Oil.—16s. per lb. Advanced.
Bourbon Geranium Oil.—28s. per lb. Again cheaper.
Camphor Oil.—65s. per cwt.
Cananga Oil, Java.—11s. 3d. per lb.
Cinnamon Oil, Leaf.—6d. per oz. Cheaper.
Cassia Oil, 80/85%.—9s. per lb.
Citronella Oil.—Java, 85/90%, 6s. per lb. Ceylon, 3s. 2d. to 3s. 5d. per lb., according to quality. Prices advanced.
Clove Oil.—7s. 9d. per lb.
Eucalyptus Oil, 70/75%.—2s. 1d. per lb.
Lavender Oil.—French 38/40% Esters, 35s. per lb.
Lemon Oil.—3s. 4d. per lb.
Lemongrass Oil.—5s. 9d. per lb.
Orange Oil, Sweet.—10s. 9d. per lb.
Otto of Rose Oil.—Bulgarian, 42s. 6d. per oz. Anatolian, 28s. per oz.
Palma Rosa Oil.—16s. 9d. per lb.
Peppermint Oil.—Wayne County, 50s. per lb. Dearer. Japanese, 21s. per lb. Cheaper.
Petitgrain Oil.—9s. 9d. per lb.
Sandal Wood Oil.—Mysore, 26s. 7d. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, January 29, 1925.

BUSINESS in the heavy chemical market during the past week has been fairly satisfactory with good inquiry both for home and export requirements. Prices with one or two exceptions remain on about the same level as last reported.

Industrial Chemicals

ACID ACETIC.—In little demand but prices unchanged, as follows:—Glacial 98/100%, £57 to £58 per ton, according to quality and packing; 80% pure, quoted £43 to £45 per ton; 80% technical, £42 to £44 per ton, packed in casks delivered c.i.f. U.K. port, duty free.

ACID BORACIC.—Remains unchanged. Crystal or granulated, £45 per ton; powdered, £47 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Moderate inquiry and price unchanged at 5¾d. per lb. delivered.

ACID CITRIC, B.P. CRYSTALS.—Good inquiry and price rather firmer at 1s. 4½d. per lb., less 5%, ex store.

ACID FORMIC, 85%.—Unchanged at about £52 per ton, ex store, spot delivery. Offered from the continent at about £51 per ton, c.i.f. U.K. port.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—£23 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—In little demand but price unchanged at 3¾d. per lb., ex store. Offered for early delivery at about ¾d. per lb. less.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Unchanged at about 11¾d. per lb., less 5%, ex store. Offered for forward delivery at about the same figure.

ALUMININA SULPHATE, 17/18% IRON FREE.—Quoted £6 10s. per ton, c.i.f. U.K. ports, prompt shipment. Spot lots available at about £7 5s. per ton, ex store.

ALUM.—Lump potash alum unchanged at about £9 15s. per ton, ex store, spot delivery. Offered from the continent at about £8 15s. per ton, ex wharf. Ammonium chrome alum of British manufacture quoted £17 per ton, f.o.b. U.K. port.

AMMONIA ANHYDROUS.—Unchanged at about 1s. 6d. per lb., ex station. Containers extra and returnable, with possible slight reduction for large quantities.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks, delivered U.K. port.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. ot 3d. per lb., delivered, according to quantity, containers extra.

AMMONIA MURIATE.—Grey galvaniser's crystals of English manufacture quoted £30 per ton, ex station, packed in casks. Bags £1 per ton less. Fine white crystals offered from the continent at about £23 per ton, c.i.f. U.K. port.

ARSENIC, WHITE POWDERED.—Spot lots unchanged at about £36 per ton, ex store. Offered for early delivery at slightly less.

BARIUM CARBONATE, 98/100%.—Offered from the continent at about £9 10s. per ton, c.i.f. U.K. port.

BARIUM CHLORIDE, 98/100%.—Fine white crystals of continental manufacture quoted £9 15s. per ton, ex wharf. Large crystals of English manufacture on offer at about £11 10s. per ton, ex store.

BLEACHING POWDER.—Spot lots quoted £10 10s. per ton, ex station, contracts 20s. per ton less.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. port.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English material unchanged at £5 12s. 6d. per ton, ex station. Continental on offer at about £4 2s. 6d. per ton, c.i.f. U.K. port.

COPPERAS, GREEN.—Unchanged at about £3 5s. per ton, ex works, packed in casks, free.

COPPER SULPHATE.—Moderate inquiry for export. British material now quoted £24 10s. per ton, f.o.b. U.K. port. Rather higher quotations from the continent, but spot material still obtainable at about £23 15s. per ton, ex store.

FORMALDEHYDE 40%.—Offered for prompt shipment from the continent at about £42 per ton, c.i.f. U.K. port. Spot lots still quoted about £47 per ton, ex store.

GLAUBER SALTS.—White crystals of English manufacture unchanged at £4 per ton, ex store or station. Fine white crystals offered from the continent at £3 5s. per ton, c.i.f. U.K. port.

LEAD, RED.—Rather cheaper quotations for imported material. Now on offer at about £46 per ton, ex store.

LEAD, WHITE.—Quoted £48 10s. per ton, ex store.

LEAD ACETATE.—Refined white crystals offered from the continent at about £48 5s. per ton, c.i.f. U.K. port. Spot material now quoted about £49 per ton, ex store.

MAGNESITE CALCINED.—Unchanged at about £7 17s. 6d. per ton, ex station, prompt delivery. Hard burnt quality quoted £4 15s. per ton, ex station. Finer quality of continental manufacture quoted £7 15s. per ton, c.i.f. U.K. port.

MAGNESIUM CHLORIDE.—Offered from the continent at £4 10s. per ton, c.i.f. U.K. port.

POTASH CAUSTIC, 88/92%.—Unchanged at about £31 per ton, ex wharf, prompt shipment from the continent.

POTASSIUM BICHROMATE.—Quoted 5d. per lb. delivered.

POTASSIUM CARBONATE.—Offered from the continent at £23 10s. per ton, c.i.f. U.K. port. 90/92% quality, £21 10s. per ton, c.i.f. U.K. port. 96/98% quoted £24 15s. per ton, ex store, spot delivery.

POTASSIUM CHLORATE.—Rather higher quotations from the continent. Now quoted about 2¾d. per lb., c.i.f. U.K. port.

POTASSIUM NITRATE, SALTPETRE.—Quoted £26 per ton, c.i.f. U.K. port, prompt shipment from the continent. Spot lots on offer at £28 15s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Spot material now quoted 8¾d. per lb., ex store. Offered from the continent at a fraction less.

POTASSIUM PRUSSIATE, YELLOW.—Offered for early delivery at 7½d. per lb., ex wharf. Spot material now quoted 7¾d. per lb. ex store.

SODA CAUSTIC.—76/77%, £18 per ton; 70/72%, £16 2s. 6d.; broken, 60%, £17 2s. 6d. per ton; powdered, 98/99%, £21 7s. 6d. per ton; all carriage paid U.K. stations, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—White crystals offered from the continent at £20 per ton, c.i.f. U.K. port. Spot material available at about £22 15s. per ton, ex store.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station; M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 4d. per lb. delivered.

SODIUM CARBONATE.—Soda crystals, £5 to £5 5s. per ton, ex quay or station; powdered or pea quality, £1 7s. 6d. per ton more; alkali, 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £10 per ton, ex station; continental quoted £8 5s. per ton, c.i.f. U.K. port; spot lots available at about £9 10s. per ton, ex store; pea crystals of English manufacture quoted £13 15s. per ton ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 17s. 6d. per ton, ex store; 96/98%, refined quality, 7s. 6d. per ton extra.

SODIUM NITRATE, 100%.—Rather better inquiry. Price £27 per ton, ex station, basis 100%.

SODIUM PRUSSIATE, YELLOW.—Moderate inquiry and price unchanged at about 4½d. per lb., ex store.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption £3 10s. per ton, f.o.r. works. Good inquiry for export and higher prices obtainable.

SODIUM SULPHIDE.—English manufacturers quote:—60/65% solid, £15 per ton; broken, £1 per ton more; flake, £2 per ton more. Crystals, 31/34%, £9 5s. per ton, carriage paid U.K. stations, minimum four ton lots with slight reduction for contracts over a period. Solid, 60/62%, offered from the continent at about £12 per ton, c.i.f. U.K. port; 30/32% crystals at about £8 10s. per ton, c.i.f. U.K. port.

SULPHUR.—Flowers, £9 10s. per ton; roll, £8 10s. per ton; rock, £8 7s. 6d. per ton; ground, £8 5s.—ex store, prices nominal.

ZINC CHLORIDE.—96/98% of continental manufacture quoted £23 per ton, c.i.f. U.K. port. English material for export on offer at about £25 to £26 per ton, f.o.b. U.K. port.

ZINC SULPHATE.—Spot material quoted £12 10s. per ton, ex store, in little demand.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ANTHRANILIC ACID.—Some home inquiry. Price 7s. 6d. per lb., 100% basis, carriage paid.

BETA NAPHTHOL.—Small home inquiry. Price 11½d. per lb. to 1s. per lb., carriage paid.

MONO METHYLAMINE.—Some export inquiry. Price 18s. per lb., 100% basis, f.o.b.

NAPHTHYLAMINE TRI SULPHO ACID 1 : 3 : 6 : 8.—Some home inquiries. Price 2s. per lb., 100% basis.

ORTHO NITRANILINE.—Home inquiry. Price 6s. 3d. per lb., delivered.

PARANITRANILINE.—Small home inquiry. Price 2s. 2d. per lb., delivered.

TOBIAS ACID.—Some home inquiry. Price 4s. 3d. per lb., 100% basis, carriage paid.

The Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, January 29, 1925.

There has been little change in the position here from that ruling since the turn of the year. Not much perceptible increase in the volume of business can be reported, the demand for most lines of heavy chemicals being of a quietly steady nature. This applies both to the home and foreign sections of the market. Quotations, however, with only a few exceptions, maintain their recent strength.

Heavy Chemicals

Bichromate of soda meets with a fair inquiry, and values are unchanged at 4d. per lb. Soda crystals are only attracting moderate attention, but prices are still on the basis of £5 5s. per ton. Hyposulphite of soda is quiet but fairly steady; photographic crystals are offering at £13 10s. to £13 15s. per ton, and commercial at about £9 10s. A steady trade is being done in caustic soda, prices ranging from £5 12s. 6d. per ton for 60 per cent. strength to £18 for 76–77 per cent. material. Prussiate of soda is firm, though not particularly active at about 4½d. per lb. Saltcake and Glauber salts are not much inquired after; prices, however, in each case are round £3 10s. per ton. Chlorate of soda is in fairly good request at 2¾d. to 3¼d. per lb. Sulphide of soda is dull, though still offering at £13 15s. to £14 per ton for 60–65 per cent. concentrated solid and £9 10s. for crystals. Phosphate of soda is inactive at about £13 per ton. Alkali is steady and meets with a fairly good demand at £6 15s. per ton. Bleaching powder is rather a quiet section at £9 10s. per ton. Quotations for bichromate of soda are still hovering round £10 10s. per ton, but business is restricted. Acetate of soda is about maintained at £21 10s. to £22 per ton.

Permanganate of potash values are well held at from 7½d. to 8¼d. per lb. Caustic soda is only moderately active, but prices keep up, the current quotation for 90 per cent. quality being £31 to £32 per ton. Carbonate of potash is also very steady at round £24 per ton. Prussiate of potash is in quietly steady demand at about 7½d. per lb. Chlorate of potash is quoted at 2⅝d. per lb., with business on a fair scale. Bichromate of potash is in moderate request at 5d. per lb.

Arsenic, though perhaps steadier than it has been, is not selling in any better quantities; white powdered, Cornish makes, is on offer at about £36 per ton in Manchester. Sulphate of copper is rather quiet at £24 10s to £25 per ton, f.o.b. Commercial Epsom salts are moderately active at about £4 10s. per ton; magnesium sulphate is quoted at £6 5s. to £6 10s. per ton. Acetate of lime is quiet but pretty well maintained; grey quality is on offer at £15 10s., and brown at £10 10s. to £11 per ton. Acetate of lead is still a strong section of the market at £47 10s. to £48 per ton for white and about £44 for brown. Nitrate of lead is not too active, but prices are about unchanged at £42 10s. per ton.

Acids and Tar Products

Acetic acid is in moderate demand at £41 to £42 per ton for 80 per cent. commercial quality, and about £68 for glacial. Oxalic acid is still quiet and easy at 3⅝d. per lb. Tartaric and citric acids are steady at 1s. and 1s. 4¼d. to 1s. 4½d. per lb. respectively.

Pitch keeps inactive, and prices are rather weak, 45s. to 47s. 6d. being quoted. Cresylic acid is still on offer at 2s. to 2s. 1d. per gallon. Carbolic is quiet, but a shade steadier at 5½d. to 5¾d. per lb. for crystals and 1s. 9d. per gallon for crude. Business in naphthalene is limited, though values are about the same; refined is quoted at £15 to £15 10s., and crude material from £5 per ton. Solvent naphtha is steady and in fair request at about 1s. 6½d. per gallon. Creosote oil is firm at 7d. to 7½d. per gallon.

Institute of Chemistry

The following candidates have passed the January examinations for the Associateship in General Chemistry:—F. E. Ball, B.Sc. (Lond.), Derby Technical College; J. D. Buxton, B.A. (Cantab.), The University, Cambridge, and King's College, London; L. J. Couzens, West Ham Municipal College and Sir John Cass Technical Institute; J. Foster, B.Sc. (Lond.), School of Mines, Treforest; E. A. Murphy, B.Sc. (Lond.), Birmingham Municipal Technical School; G. W. Trobridge, B.Sc. (Birm.), The University, Birmingham; W. J. Walker, Heriot-Watt College, Edinburgh; and W. Wilson, Paisley Technical College.

Canada's Chemical and Metallurgical Industries

A Report of Interest to British Producers

Canada's second largest industry is mining, and its further development is of great importance to the whole Empire. The progress and prospects of Canada's industries and natural resources are set forth in the report entitled The Development of Chemical, Metallurgical and Allied Industries in Canada, just issued by the Mines Branch of the Department of Mines at Ottawa.

This report embodies some of the results of a series of special studies of the utilisation of minerals and mineral products which have been made by Dr. Alfred W. G. Wilson, chief engineer of the Mineral Resources Division of the Mines Branch. It presents a general view of the present status of chemical and metallurgical industries in Canada, and, by showing the important relations which exist between the mineral industry and manufacturing, agricultural, and other industries, indicates broadly the opportunities for future expansion and development. Dr. Wilson points out that it is doubtful if any other industry, even agriculture, offers as great opportunities as does mining for immediate expansion and development resulting from new uses of natural resources. An important fact brought out by a series of tables of statistics is that in one group of 21 industries 56 per cent. of the capital is Canadian owned, 34 per cent. is owned by the United States, and only 9 per cent. in Great Britain, the balance of ownership being distributed in other countries. The report states that "Unless the share held by foreign capital in the control and exploitation of the majority of Canadian manufactures and raw materials is to be predominant, British enterprise and Empire capital must assume their share of both the responsibility and reward." One of the most valuable features of the report is a series of lists showing the various kinds of raw materials required by each of a large number of industries. These lists show at a glance what native raw materials are available to industries in Canada and what materials must be imported. They should prove invaluable to importers and producers, and they incidentally furnish the manufacturer with something more than a bare table of statistics about the products essential to his business. Copies of the report may be obtained from the Director, Mines Branch, Department of Mines, Ottawa.

Indian Boiler Tests

Some Interesting Figures

Boiler plant efficiency is a subject of more importance than ever in these days of high costs of production, especially in connection with the burning of cheap and low grade fuels. In this connection there has been made public the results of an interesting series of tests that have been carried out with difficult Bengal coals at the Ganges Jute Mill, Seebpore, near Calcutta, under the superintendence of the chief engineer, Mr. J. D. Campbell. The coals used were Alkusa slack, 10,000 B.Th.U. per lb.; Alkusa steam coal, 12,000 B.Th.U.; new Tetruria coal, 8,000-9,000 B.Th.U., and Damaguria slack, 12,000 B.Th.U., all of which possess a high ash content, varying from 22 per cent. to 38 per cent., extreme friability, and a great variation in the quality, which latter characteristic is particularly objectionable. For these tests a standard 30 ft. by 8 ft "Lancashire" boiler, with 3 ft. 3 in. furnace tubes and 6 ft. grate length, was fitted with the "Turbine" furnace and a detailed series of trials run alongside a similar boiler on normal condition of natural draught, every care being taken to ensure equal conditions as regards steam output, whilst all the water evaporation was weighed in tanks.

Expressing the matter in a few words, the net result for a large number of tests was that the saving obtained by the use of the "Turbine" furnace averaged 25-45 per cent. of the coal bill, depending upon the fuels used and the conditions as regards steam demand, and so highly satisfactory are the figures that we understand an order has been placed for all the boilers in the mill, 17 in number, to be equipped. Apart from the above substantial economy Mr. Campbell states there were found to be several other practical advantages in the use of forced draught on these lines, one of the most important of which was the rapidity with which steam can be raised again after cleaning out, which incidentally does not take more than about 3 per cent. of the steam production of the plant, very little in excess of mechanical induced or forced draught in which the figure averages about 2-2½ per cent.

Company News

W. J. Bush and Co.—An interim dividend of 3 per cent., less tax, was paid on January 22 on the ordinary shares.

Consett Spanish Ore.—The directors have resolved to pay an interim dividend of 1s. 6d. per share, against 1s. per share a year ago.

English China Clays, Ltd.—A dividend is announced on the cumulative preference shares at the rate of 7 per cent. per annum for the half-year ended December 31 last, payable on February 2.

The Gas Light and Coke Co.—The directors recommend a dividend on the ordinary stock at the rate of 5⅓ per cent. per annum for the half-year ended December 31 last. The sum of £223,583 is carried forward.

Lautaro Nitrate Co., Ltd.—A first interim dividend is announced on account of the year 1925 of 5 per cent., or 5s. per share, less tax, payable on February 12. A similar distribution was made this time last year.

Commercial Gas Co.—The directors recommend dividends for the half year to December last at the rates of £5 14s. 8d. per cent. per annum on the 4 per cent. stock and £5 13s. 4d. per cent. per annum on the 3½ per cent. stock, less tax.

English Velvet and Cord Dyers' Association, Ltd.—The directors announce a final dividend at the rate of 14 per cent. per annum on the ordinary shares, making with the interim dividend a total of 10 per cent. for the year ended December 31 last. The sum of £5,000 is placed to reserve, £2,500 to employés' fund and £30,195 carried forward.

Benzol and By-Products, Ltd.—The report for the year ended September 30 last states that the net profit, after deducting depreciation, income tax, reserve, etc., amounts to £30,344, which, with the balance brought forward of £47,934, makes a total sum of £78,278 available for distribution. The cumulative preference dividend of 6 per cent. per annum paid for the period ended March 31, 1924, and 2½ per cent. participating preference dividend, absorbed (including income tax) £22,441, leaving at September 30 last a balance of £55,837. The preference dividend instalment of 3 per cent. was paid on October 2, 1924. The board now recommends the following dividends: 2½ per cent. non-cumulative dividend on preference shares and 11 per cent. on ordinary shares, making total distribution of 11 per cent. respectively for the year.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to February 28, 1925.

"Ultra-Raylite."

453,606. For paints and varnishes. Class 1. Hull Chemical Works Company, Kirkby Street, Kingston-upon-Hull; manufacturers. November 13, 1924. Registration of this Trade Mark shall give no right to the exclusive use of the word "Ultra."

"Ova."

453,893. For carbonate of lime, being a chemical substance. Class 2. William Gossage and Sons, Ltd., Widnes, Lancashire; manufacturers. November 22, 1924.

"Creomulsion."

450,516. For chemical substances prepared for use in medicine and pharmacy. Creomulsion Company (a Corporation organised and existing under the laws of the State of Georgia. United States of America). Walton Buildings, Walton Street, Atlanta, County of Fulton, State of Georgia, United States of America; manufacturers. July 25, 1924.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Chemicals.—An agent in Marseilles wishes to represent British manufacturers of tallow for soap works, and also chemicals and perfumery essences used in the manufacture of soap. (Reference No. 97.)

Oils, Paints, Tar, etc.—Tenders are invited by Hammersmith Borough Council for the supply of oils, paints, varnishes, lubricating oils, disinfectants. Tenders to Mr. H. Royle, Town Hall, by February 18.

Tar.—Tenders are invited for supply of 12,000 gallons of distilled tar by Littlehampton Council. Tenders to Clerk, Town Offices, by February 11.—230,000 gallons Nos. 1 and 2 Road Board Standard, by Westmorland County Council, County Surveyor, 12, Lowther Street, Kendal, by February 13.—100 tons refined tar, Road Board Specification No. 1, by Rugby Town Council. Tenders by February 2.

Tariff Changes

British India.—Extensive revisions of import and export duties took effect on January 1. Full details are given in *The Board of Trade Journal* of January 22.

Bolivia.—The Customs Duty on crude petroleum imported has been reduced from 2 cts. to 1 ct. per kilog. (net weight). The Municipal Taxes on this article are also reduced by 50 per cent.

France.—A Law imposes regulations for the control of the wholesale importation of crude petroleum and its derivatives and residues. Wholesale importation is defined as an importation of 1,000 kilogs. or more, or any grouping of consignments amounting to more than that quantity, or any series of importations amounting to 15,000 kilogs. or more per month. The wholesale importation necessitates a licence from the Ministry of Commerce and Industry. This licence takes the place of the ordinary import licences formerly required for the importation of these goods, except in the case of petroleum spirit and similar spirits, pure or mixed, and of benzols, benzines, toluenes and spirits derived from coal tar, pure or mixed. The importation of crude petroleum and its derivatives and residues is subjected to a levy of 10 frs. per metric ton, except in the case of those petroleum residues to be used for certain purposes which are admitted at special duties, for which the levy is reduced to 1.50 frs. per metric ton. This levy is to be collected by the Customs. The manufacturing tax on crude mineral oils is abolished.

Germany.—Recent orders have added to the list of articles which can be exported without a licence. The following are therefore the only important articles of interest to the chemist which require a licence:—

From Category II.—Earths and Stones. Natural phosphate of lime.

The following ores, slag and ashes:—antimony, arsenic, lead, chrome, nickel, iron, gold, platinum, silver, copper, copper regulus, etc., calcined cupreous pyrites, manganese, pyrites and other sulphur ores containing native sulphur, wolfram, tin, uranium, molybdenum, zinc ore (including zinc silicate, willemit and other zinc ores containing oxygen and zinc blende) and other ores not specially mentioned in the Tariff, lead, brass and other metal ash (oxides) not specially mentioned in the Tariff. Coal, anthracite, unmanufactured cannel coal, pulverised or not, lignite, ground or not, coke, ground or not, coal and lignite briquettes. Coal tar.

From Category IV.—Chemical and Pharmaceutical Products, Colours, etc. Radium and mesothorium and salts thereof; radium preparations. Gold chloride in consignments of more than 50 grs. (net weight); silver nitrate and silver chloride in consignments of more than 500 grs. (net weight). Bone ash, Thomas' phosphate meal and phosphatic manures treated with acids (superphosphates), combined or not with other materials; also substances dutiable in themselves and used as manures under control.

Turkey.—Anthracite is now subject to an import duty of 10 piastres per 100 kilogs.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BAILEY, Richard Douglas, 20, Church Road, Seaforth, analytical chemist. (C.C., 31/1/25.) £11 4s. 6d. December 22.

MORRISON RODGERS, LTD., Burley Road, Leeds, manufacturing chemists. (C.C., 31/1/25.) £12 17s. 3d. December 12.

PREMIER DRUG CO., LTD., Fairy Hill Works, Marwood Street, Hightown, Manchester, chemists. (C.C., 31/1/25.) £48 17s. 7d. November 28.

WATERHOUSE AND GRAY, LTD., 42/51, Stanley Street, Sheffield, chemists. (C.C., 31/1/25.) £18 4s. 7d. September 26.

Bill of Sale

ST. JOHN FARROW, Heatherdown, 75, Cambridge Road, Teddington, wholesale druggists' sundriesman. (B.S., 31/1/25.) Filed January 19. £400.

Receivership

SHEAF TURPS PRODUCERS, LTD. (R., 31/1/25.) J. A. Gregory, of 2, Rectory Chambers, 24, Norfolk Row, Sheffield, ceased to act as receiver or manager on January 12, 1925.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

HODGKINS, LTD., London, S.W., dyers. (M., 31/1/25.) Registered January 15, debenture to Bank; general charge. *——. December 31, 1923.

KEELINGS OXIDES (1921), LTD., Stoke-on-Trent. (M., 31/1/25.) Registered January 1, £50,000 debentures with bonus of 5 per cent. (filed under section 93 (3) of the Companies (Consolidation) Act, 1908), present issue £10,250; general charge (subject to existing debenture). *£20,000. January 23, 1923.

Satisfaction

LEVER BROTHERS, LTD., Port Sunlight, soap manufacturers. (M.S., 31/1/25.) Satisfaction registered January 16, £32,600, part of amount registered April 13, 1921.

London Gazette, &c.

Company Winding Up

ROLSTON AND ABBOTT, LTD. (C.W.U., 31/1/25.) Winding-up order, January 20.

Company Winding Up Voluntarily

BRITISH SUPER-CARBON CO., LTD. (C.W.U.V., 31/1/25.) A. C. Vincent, incorporated accountant, 13, Queen Street, Cheapside, E.C., appointed liquidator, January 19.

New Companies Registered

ASIATIC PETROLEUM COMPANY (SYRIA), LTD., St. Helen's Court, Gt. St. Helens, London, E.C.3. Producers, refiners, suppliers, sellers and distributors of petroleum and other oils, etc. Nominal capital, £5,000 in £10 shares.

A. W. PRENTICE AND CO., LTD., 41, North John Street, Liverpool. Manufacturers of and dealers in oils, varnishes, and paints; chemists, drysalters, oil and colourmen, etc. Nominal capital, £2,500 in £1 shares (600 7 per cent. cumulative preference and 1,900 ordinary).

PULP ECONOMISERS, LTD., 1, Broad Street Place, London, E.C.2. Paper merchants, manufacturers of, and dealers in, paper pulp, and materials used in the manufacture, production or reproduction of paper, inks, dyes, bleaches, chemicals and mineral substances, etc. Nominal capital, £30,000 in £1 shares.

VAR OIL CO., LTD., Pinner's Hall, Austin Friars, London, E.C. To acquire mines, oil wells, etc., to buy, sell and manufacture minerals, crude and refined oils and spirits, etc. Nominal capital, £175,000 in 700,000 shares of 5s. each.

American Market Movements

(From *Drug and Chemical Markets.*)

INDUSTRIAL chemicals continue to gain in strength although trading remains quiet. Barium carbonate higher. Copper sulphate easy. Oxalic acid unsettled. Prussiates up again. Lead pigments firm at advance. Bichromates firmer. Ammonium chloride weak. Potash alum firm. Antimony salts steady at advance. Intermediates strong with the exception of para-nitroaniline which is selling at lower levels. Demand continues dull. Aniline oil and beta-naphthol bolding firm. Ortho-toluidine firm at recent advance. Pyridine higher. Phenol, cresylic acid and naphthalene remain very quiet. Benzene steady. Toluene scarce and active. Solvent naphtha firm.

Fine chemicals show tendency to advance on scarcity. Codliver oil is higher on active demand and firmer shipment prices. Bromides are steady. Menthol is lower on spot, although Japanese producers appear firm due to high cost of oil. Potash permanganate is firmly held.

The German Chemical Market

(*Supplied by Nicolaus Oláh, Thaliahof, Hamburg, 1, Den.*)

THE number of small export orders given during the last week was quite satisfactory, but it was often impossible to carry them out on account of the prices offered. Some business was done in naphthalene and transactions were carried out on a basis of £14. Sales in tartaric acid and citric acid were concluded for later deliveries and the price—basis of $46—for the latter is unchanged. Caustic potash is almost unobtainable, some small lots were offered on the basis of $16. Magnesium chloride was slow. On account of the lowered quotations for sulphide of sodium last week transactions for greater quantities were made so that all available material may be considered as cleared. £49 is offered from second hand for permanganate of potash in larger quantities from 5 tons upwards and some business was done on this basis. Prompt available carbonate of potash was quoted at $10.50, considering that manufacturers have no material for prompt delivery. There was a great demand for chlorate of potash and prompt material is scarcely to be had, general offers read $9.50.

Canada's Mining Industries in 1924

IN the course of an annual review of the mining industries of Canada during the past year, issued by the Department of Mines, reference is made to the impetus given to industry by the Dominion's exhibit at the British Empire Exhibition.

Gold mining is thriving, efforts are being made to extend the market for silver, and the nickel industry has shown great activity. Copper is meeting keen competition, but lead and zinc mining has remained steady, and owing to increased output zinc concentrates are now being sent to Belgium for treatment. The production of aluminium has made great progress, but there was a considerable falling off in the production of coal during last year. The asbestos industry has experienced strong competition from the Rhodesian mines. The high prices paid for white arsenic called attention to the possibilities of Canadian sources. The principal source in Canada has been for many years the arsenides and sulpharsenides of cobalt and nickel of the Cobalt silver mining district. During 1924 mining of the arsenical gold ores of Hedley, British Columbia, was resumed, and shipments of concentrates carrying arsenic and gold were made from Nova Scotia.

The prospects of Canada's mining industries generally during 1925 are thought to be bright.